BIENNIAL REPORT

OF THE

BOARD OF HORTICULTURE

OF THE

STATE OF OREGON

1901-1902

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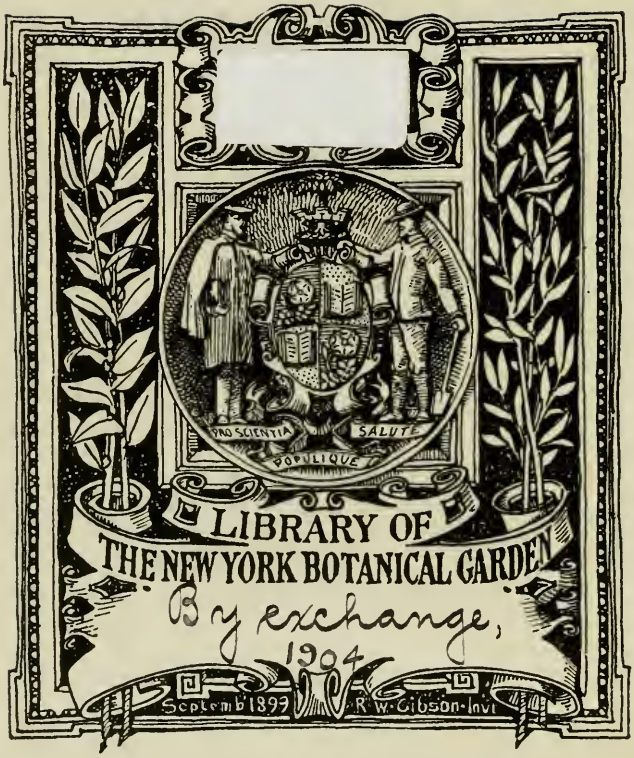
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Compliments of
OREGON STATE BOARD OF HORTICULTURE.
GEO. H. LAMBERSON, Sec'y.

"ALIS VOLAT PROPRIIS."

SEVENTH BIENNIAL REPORT

OF THE

BOARD OF HORTICULTURE

TO THE

TWENTY-SECOND LEGISLATIVE ASSEMBLY

OF THE

STATE OF OREGON

1902

SALEM, OREGON
W. H. LEEDS, STATE PRINTER
1902

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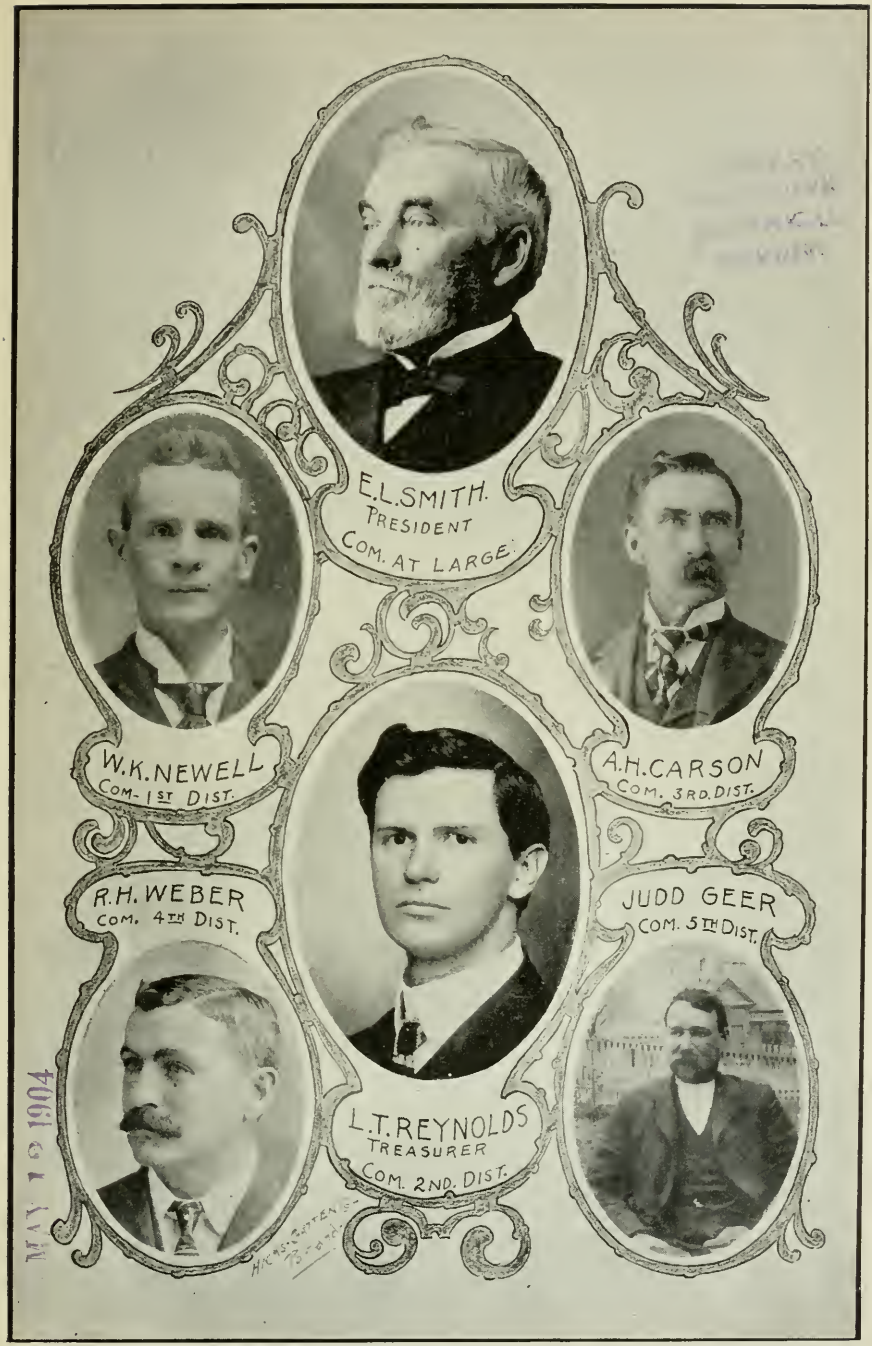


MAY 19 1904

COMMISSIONERS STATE BOARD OF HORTICULTURE—1902.

TO THE FRUIT GROWER.

This report is sent to you with the compliments of the board, trusting you may find something of personal interest to you.

For further information, kindly address the commissioner of your district, who will cheerfully answer all communications appertaining to horticultural matter, and who will also visit you, and neighbors, if you so desire.

The commissioner of your district will deem it a special favor if you will inform him of any orchards in your neighborhood which are infected, and the owners thereof counseled with, in order to cleanse and eradicate any insects on their premises.

In order to avoid confusion and simplify matters, we have given only such sprays as we have found by personal experiments to be of any value and yet cover all insects and fungous diseases known to exist in Oregon.

OFFICERS OF THE BOARD.

E. L. SMITH, - - - - - - - - - - - PRESIDENT
L. T. REYNOLDS, - - - - - - - - - - TREASURER
GEO. H. LAMBERSON, - - - - - - - - - SECRETARY
OFFICE: PORTLAND, OREGON.

BOARD OF COMMISSIONERS.

STATE AT LARGE,
E. L. SMITH, - - - - - - - - - - - HOOD RIVER
FIRST DISTRICT,
W. K. NEWELL, - - - - - - - - - - - - DILLEY
SECOND DISTRICT,
L. T. REYNOLDS, - - - - - - - - - - - SALEM
THIRD DISTRICT,
A. H. CARSON, - - - - - - - - - - - GRANTS PASS
FOURTH DISTRICT,
R. H. WEBER, - - - - - - - - - - - THE DALLES
FIFTH DISTRICT,
JUDD GEER, - - - - - - - - - - - - - COVE

DISTRICT BOUNDARIES.

FIRST DISTRICT,
Multnomah, Clackamas, Yamhill, Washington, Columbia, Clatsop, and Tillamook Counties.

SECOND DISTRICT.
Lincoln, Marion, Polk, Benton, Linn, and Lane Counties.

THIRD DISTRICT,
Douglas, Jackson, Klamath, Josephine, Coos, Curry, and Lake Counties.

FOURTH DISTRICT,
Morrow, Wasco, Gilliam, Crook, and Sherman Counties.

FIFTH DISTRICT,
Umatilla, Union, Baker, Wallowa, Malheur, Grant, and Harney Counties.

HORTICULTURAL LAW.

AS PASSED BY THE LEGISLATURE, FEBRUARY, 1895.

An Act to amend an act entitled "An act to create a State Board of Horticulture and appropriate money therefor," approved February 25, 1889, and an act amendatory thereof entitled 'An act to amend an act entitled 'An act to create a State Board of Horticulture and appropriate money therefor,' approved February 25, 1889," approved February 21, 1891, and to protect the horticultural industry in Oregon.

Be it enacted by the Legislative Assembly of the State of Oregon:

Section 1. There is hereby created a Board of Horticulture to consist of six members, who shall be appointed by a board, consisting of the Governor, Secretary of State, and State Treasurer. One member of the said Board of Horticulture shall represent the state at large, and one member shall be appointed to represent each of the five districts as hereby created, to wit (provided that the commissioner-at-large shall not receive any pay for his services): (1) The first district, which shall comprise the counties of Multnomah, Clackamas, Yamhill, Washington, Columbia, Clatsop, and Tillamook; (2) the second district, which shall comprise the counties of Marion, Polk, Benton, Lincoln, Linn, and Lane; (3) the third district, which shall comprise the counties of Douglas, Jackson, Klamath, Josephine, Coos, Curry, and Lake; (4) the fourth district, which shall comprise the counties of Wasco, Sherman, Morrow, Gilliam, and Crook; (5) the fifth district, which shall comprise the counties of Umatilla, Union, Wallowa, Baker, Malheur, Harney, and Grant.

Section 2. The members shall reside in the districts for which they are respectively appointed. They shall be selected with reference to their knowledge of and practical experience in horticulture and the industries connected therewith. They shall hold office for the term of four years, and until their successors are appointed and have qualified; but the members of said board now in office shall hold office till the expiration of the term for which they were appointed.

Section 3. Said board shall employ from without their number a secretary, who shall exercise the powers and discharge the duties conferred upon him by this act and whose compensation shall not exceed $75 per month, to be paid in the same manner as other state officers. Said board shall also elect from their own number a treasurer, who shall give a bond to the Governor of the State of Oregon in the sum of $10,000, conditioned upon the faithful discharge of his duties. Before entering upon the discharge of his duties, each member of the board shall make and subscribe an oath to support the Constitution of the United States and of the State of Oregon, and

to diligently, faithfully, and impartially discharge the duties of his office, which said oaths shall be filed with the secretary. The secretary shall make and subscribe a like oath, which shall be filed with the treasurer of the board.

Section 4. The board may receive, manage, use, and hold donations and bequests of money and property for promoting the objects of its formation. It shall meet on the second Mondays of April and October of each year, and as much oftener as it may deem expedient for consultation and for the adoption of those measures which will best promote the horticultural industries of the state. It may, but without expense to the state, select and appoint competent and qualified persons to lecture in each of the districts named in section 1 of this act, for the purpose of encouraging and improving practical horticulture, and of imparting instruction in the best methods of treating the diseases of fruit and fruit trees, cleansing orchards and exterminating insect pests.

Section 5. The office of the board shall be located in such place as a majority thereof may determine. It shall be kept open to the public, subject to the rules of the board, every day excepting Sundays and legal holidays, and shall be in charge of the secretary during the absence of the board.

Section 6. For the purpose of preventing the introduction into the state or spread of contagious diseases, insects, pests, or fungous growths among fruit or fruit trees, and for the prevention, treatment, cure, and extirpation of fruit pests, and diseases of fruit and fruit trees, and for the disinfection of grafts, scions, orchard debris, fruit boxes and packages, and other material or transportable articles dangerous to orchards, fruit or fruit trees, said board may make regulations for the quarantining, inspection, and disinfection thereof, which said regulations shall be circulated by the board in printed form among the fruit growers and fruit dealers of the state; shall be published at least four successive times in some daily or weekly paper in each county in the state before the same shall be in force therein, and shall be posted in three conspicuous places in each county in the state, one of which shall be at the county courthouse. Such regulations, when so promulgated, shall be held to import notice of their contents to all persons within the state, and shall be binding upon all persons therein. A willful violation of any quarantine or other regulation of said board, necessary to prevent the introduction into the state, or the shipment, sale or distribution of any article so infected as to be dangerous to the fruit growing interest of the state, or the spread of dangerous diseases among fruit trees or orchards, shall be deemed a misdeameanor, and on conviction thereof shall be punished by a fine of not less than $5.00 nor more than $100 for each offense, or by fine and imprisonment, not less than five nor more than thirty days.

Section 7. It shall be the duty of the several members of the board, and the secretary under their direction, to visit their respective districts and to see that all regulations of the board and all provisions of law to prevent the introduction or spread of fruit pests and diseases of trees or plants injurious to the horticultural interests of the state are enforced. Any mem-

ber of the board, or the secretary thereof, shall forthwith, upon the complaint of interested parties, inspect orchards, nurseries and other places suspected to be infested with fruit pests or infected with contagious diseases injurious to the trees, plants or fruits. If, upon report of any member or the secretary, the board shall be of the opinion that any locality, district, orchard or place is infested with fruit pests or infected with contagious diseases, or injurious to trees, plants or fruits, and liable to spread to other orchards or localities to their damage or injury so as to be a public danger, said board shall, by an order entered upon its minutes, declare such place to be under quarantine, and shall give notice thereof by posting a notice in writing in a conspicuous place upon the premises, specifying with convenient certainty what place or premises are under quarantine regulations, and by delivering a copy of such notice to the owner or person in charge of the premises, if he may be found thereon: and such place shall thereafter be subject to quarantine regulations of the board, and violation thereof shall be punishable as hereinbefore provided. As soon as, in the opinion of any member of the board or the secretary thereof, the danger from such quarantine locality shall have ceased, he may suspend the said quarantine, and shall immediately report the fact to the board, who may confirm such action or may re-establish the said quarantine, in which case it shall not be again suspended but by action of the board.

Section 8. The board, and, in case of necessity during the recess of the board, the member residing in the quarantined district, or the secretary, may appoint such quarantine guardian as may be needed to carry out the provisions of this act, whose duty it shall be to see that the regulations of the board and the instructions of the secretary are enforced and carried out. They shall also report to the board all infractions or violations of said regulations or the law in regard to quarantining, disinfection, and destruction of pests. The salary of quarantine guardians shall be fixed by the board at not to exceed $2.00 per day, and shall be paid by the owners of orchards or other places under quarantine, and they may maintain an action therefor before any justice of the peace in any district in which any quarantined locality is wholly or in part located; but in no case shall they have any claim upon the state for such services.

Section 9. The powers conferred in the two preceding sections of this act shall be exercised only in great and imminent danger to the fruit interests of the state, and with the utmost caution and regard for the rights of individuals affected, consistent with the safety and welfare of the fruit interests of the whole state.

Section 10. It shall be the duty of the several members of the board, and of the secretary, under their direction, whenever they shall deem it necessary, to cause an inspection to be made of any orchard, nurseries, trees, plants, vegetables, vines, or any fruit packing-house, storeroom, salesroom, or any other place within their districts, and if found infested with any pests, diseases or fungous growths injurious to fruits, plants, vegetables, trees, or vines, or with their eggs or larvæ, liable to spread to other places or localities, or such nature as to be a public danger, they shall notify the owner or owners, or person in charge of or in possession of such articles, things or

places, that the same are so infested, and shall require said persons to eradicate or destroy said insects or pests, or their eggs or larvæ, or to treat such contagious diseases within a certain time, to be specified in said notice. Said notices may be served upon the person or persons, or any of them, owning, having charge, or having possession of such infested place, article, or thing, by any member of the board, or by the secretary thereof, or by any person deputied by the said board for that purpose, or they may be served in the same manner as a summons in an action at law. Such notice shall contain directions for the application of some treatment approved by the commissioners for the eradication or destruction of said pests, or the eggs or larvæ thereof, or the treatment of contagious diseases or fungous growths. Any and all such places, orchards, nurseries, trees, plants, shrubs, vegetables, vines, fruit or articles thus infested are hereby declared to be a public nuisance; and whenever any such nuisance shall exist at any place in the state on the property of any owner or owners upon whom or upon the person in charge or possession of whose property notice has been served as aforesaid, and who shall have failed or refused to abate the same within the time specified in such notice, or on the property of any nonresident, or any property not in the possession of any person and the owner or owners of which can not be found by the resident member of the board or the secretary, after diligent search within the district, it shall be the duty of the board, or the member thereof in whose district said nuisance shall exist, or the secretary under his or their direction, to cause such nuisance to be at once abated, by eradicating or destroying said insects or pests, or their eggs or larvæ, or by treating or disinfecting the infested or diseased articles. The expense thereof shall be a county charge and the county court shall allow and pay the same out of the general fund of the county. Any and all sums so paid shall be and become a lien upon the property and premises from which said nuisance shall have been removed or abated, in pursuance of this act, and may be recovered by a suit in equity against such property or premises: which suit to foreclose such liens shall be brought in the circuit court of the county where the premises are situated by the district attorney, in the name and for the benefit of the county making such payments. The proceedings in such cases shall be governed by the same rules, as far as may be applicable, as suits to foreclose mechanics' liens, and the property shall be sold under the order of the court, and the proceeds applied in like manner. The board is hereby invested with the power to cause such nuisances to be abated in a summary manner.

Section 11. It shall be the duty of the secretary to attend all meetings of the board, and to preserve records of the proceedings, correspondence and actions of the board, to collect books, pamphlets, periodicals, and other documents, containing valuable information relating to horticulture, and to preserve the same; to collect statistics and general information showing the actual condition and progress of horticulture in this state and elsewhere; to correspond with agricultural and horticultural societies, colleges and schools of agriculture and horticulture, and such other persons and bodies as may be directed by the board, and prepare, as required by the board, reports for publication.

Section 12. The board shall, biennially, in the month of January, report to the legislative assembly a statement of its doings, with a copy of the treasurer's report for the two years preceding the session thereof. The members shall receive as compensation their actual expenses while engaged upon the work of the board or the enforcement of the provisions of this act, and shall be allowed $3.00 a day for the time actually employed.

Section 13. The treasurer shall receive all moneys belonging to the board and pay out the same only for bills approved by it, and shall render annually to the board a statement in detail of all receipts and disbursements.

Section 14. There is hereby appropriated for the uses of the State Board of Horticulture, as set forth in this act, the sum of $4,500 for the year beginning January 1, 1895, and the sum of $4,500 for the year beginning January 1, 1896, out of any moneys in the state treasury not otherwise appropriated, and the Secretary of State shall draw his warrant in favor of the treasurer of the board for said sum upon the State Treasurer.

Section 15. That the fruit and horticultural interests of this state being in urgent need of the protection afforded by this act, an emergency exists, and this act shall take effect from and after its approval by the Governor.

Passed by the house February 11, 1895.

CHARLES B. MOORES,
Speaker of the House.

Passed by the senate February 15, 1895.

JOSEPH SIMON,
President of the Senate.

Approved February 23, 1895.

WILLIAM P. LORD,
Governor.

AN ACT [S. B. 61.]

To amend an act entitled "An act to create a State Board of Horticulture and appropriate money therefor, approved February 25, 1889, and an act amendatory thereof, entitled 'An act to amend an act entitled an act to create a State Board of Horticulture and appropriate money therefor,' approved February 25, 1889, approved February 21, 1891, and to protect the horticultural industry in Oregon, and an act amendatory thereof, entitled an act to amend an act entitled 'An act to create a State Board of Horticulture and appropriate money therefor,' approved February 25, 1889, and an act amendatory thereof, entitled an act to amend an act entitled 'An act to create a State Board of Horticulture and appropriate money therefor, approved February 25, 1889,' approved February 21, 1891, and to protect the horticultural industry in Oregon," approved February 23, 1895.

Be it enacted by the Legislative Assembly of the State of Oregon:

Section 1. Section 1 of an act entitled "An act to amend an act entitled 'An act to create a State Board of Horticulture and appropriate money therefor,' approved February 25, 1889, and an act amendatory thereof, entitled an act to amend an act entitled 'An act to create a State Board of Horticulture and appropriate money therefor, approved February 25, 1889,' approved February 21, 1891, and to protect the horticultural industry in Oregon," be and the same is hereby amended so as to read as follows:

Sec. 1. There is hereby created a Board of Horticulture, to consist of six members, who shall be appointed by a board, consisting of the Governor, Secretary of State, and State Treasurer. One member of the said Board of Horticulture shall represent the state at large and shall be the president and executive officer of the board, and one member shall be appointed to represent each of the five districts as hereby created, to wit: (1) The first district, which shall comprise the counties of Multnomah, Clackamas, Yamhill, Washington, Columbia, Clatsop, and Tillamook; (2) the second district, which shall comprise the counties of Marion, Polk, Benton, Lincoln, Linn, and Lane; (3) the third district, which shall comprise the counties of Douglas, Jackson, Klamath, Josephine, Coos, Curry, and Lake; (4) the fourth district, which shall comprise the counties of Wasco, Sherman, Morrow, Gilliam, and Crook; (5) the fifth district, which shall comprise the counties of Umatilla, Union, Wallowa, Baker, Malheur, Harney, and Grant.

Section 2. Section 2 of an act entitled "An act to amend an act entitled 'An act to create a State Board of Horticulture and appropriate money therefor, approved February 25, 1889,' and an act amendatory thereof, entitled 'An act to amend an act entitled an act to create a State Board of Horticulture and appropriate money therefor, approved February 25, 1889,' approved February 21, 1891; and to protect the horticultural industry in Oregon," be and the same is hereby amended so as to read as follows:

Sec. 2. The members shall reside in the districts for which they are respectively appointed. They shall be selected with reference to their knowledge of and practical experience in horticulture and the industries connected therewith, and shall be engaged in practical horticulture during their incumbency of the office of commissioner. They shall hold office for the term of four years, and until their successors are appointed and have qualified, unless removed by the appointing board for failure to perform their duties. It shall be the duty of the president to visit, at least once a year, every district, and examine the orchards, nurseries, and work of the district commissioners, and ascertain whether or not the law and regulations of the board are being properly executed. He must personally inspect most of the orchards during the fruit-growing season, see that the regulations of the board regarding spraying are being faithfully executed wherever insects, pests or disease injurious to tree or fruit are to be found. He must visit the principal fruit-shipping points during the shipping season, inspect the fruit shipped, and prevent the shipment of insect and pest-infested fruit. He shall give notice through the public press one week in advance of his visit to each county, giving the time and place of his visit, where he shall receive complaints of fruit growers and distribute to them printed and oral instructions regarding destruction of pests, and other information, including proper methods of handling, packing and shipping fruits. It shall also be his duty to visit, when possible, if requested by an association or a number of fruit growers, the meetings of such associations of fruit growers, and aid them in the organization of proper associations beneficial to the growing and marketing of fruits. The president shall preside at all the meetings of the board, and may call special meetings whenever an emergency may re-

quire it. He shall make an annual report to the appointing board of the general condition of the fruit interests of the state and success of the commissioners in the work of exterminating pests and executing the law.

Section 15 Inasmuch as the provisions of this act are of immediate importance to the horticultural interests of this state, this law shall take effect from and after its approval by the Governor.

Approved February 17, 1899.

AN ACT [H. B. 238.]

To protect the fruit and hop industry in the State of Oregon.

Be it enacted by the Legislative Assembly of the State of Oregon:

Section 1. It shall hereafter be unlawful for any person, firm, or corporation, owning or operating any nursery, fruit orchard of any kind, hopyards, flower gardens, or ornamental trees, to throw any cuttings or prunings from any fruit trees, nursery stock, ornamental trees, or hop vines into any public road, highway, lane, field, or other inclosure, or into any water course of any kind; but shall destroy such cuttings or prunings with fire within thirty days from the time such cuttings or prunings are made.

Section 2. It shall hereafter be the duty of any person, firm, or corporation owning or operating any such nursery, fruit orchard, hopyard, flower garden, or ornamental trees, and knowing such to be infected with any kind of insects, pests, or disease, to immediately spray or destroy the same, in such manner as the fruit commissioner for his district may direct.

Section 3. It shall be unlawful for any person, firm, or corporation doing business in the State of Oregon to sell paris green, arsenic, london purple, sulphur, or any spray material or compound for spraying purposes, in quantities exceeding one pound without providing with each package sold a certificate duly signed by the seller thereof, guaranteeing the quality and per cent of purity of said materials.

Section 4. Any person, firm, or corporation selling any of the above materials which do not conform with the certificate furnished therewith shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be subject to a fine of not less than twenty-five ($25) dollars nor more than one hundred ($100) dollars.

Section 5. It shall be unlawful for any person, firm, or corporation to import or sell any infested or diseased fruit of any kind in the State of Oregon.

Section 6. Every person who packs or prepares for shipment to any point without the state, or who delivers or causes to be delivered to any express agent, or railroad agent, or other person, or to any transportation company or corporation for shipment to any point without the state, any fruit or fruits, either fresh, cured, or dried, that is infected with insects, pests or diseases injurious to trees, shrubs, plants, fruits or vegetables, is guilty of a misdemeanor.

Section 7. Any person, firm, or corporation violating any of the provisions of this act shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be punished by a fine of not less than twenty-five ($25) dollars nor more than one hundred ($100) dollars.

Section 8. It shall be the duty of the commissioner of the State Board of Horticulture of the district in which a violation of this act occurs, to present the evidence of the case to the district attorney, whose duty it shall be to prosecute any person guilty of a violation of this act, which prosecution may be brought in any of the justice courts of this state.

Section 9. Inasmuch as the horticultural interests of this state demand immediate attention, this act shall be in full force and effect from and after its approval by the Governor.

Approved by the Governor.

QUARANTINE REGULATIONS.

At a special meeting of the Oregon State Board of Horticulture, held in Portland April 2, 1895, all members present, the following regulations were adopted, in accordance with the laws regulating such matters, and are, therefore, binding upon all persons:—

Rule 1—All consignees, agents, or other persons, shall, within twenty-four hours, notify the quarantine officer of the State Board of Horticulture, or a duly commissioned quarantine guardian, of the arrival of any trees, plants, buds, or scions at the quarantine station in the district of final destination.

Rule 2—All trees, plants, cuttings, grafts, buds, or scions imported or brought into the state from any foreign country, or from any of the states or territories, are hereby required to be inspected upon arrival at the quarantine station in the district of final destination; and if any such nursery stock, trees, plants, cuttings, grafts, buds, or scions are found to be free of insect pests and fungous diseases, the said quarantine officer or duly commissioned quarantine guardian shall issue a certificate to that effect; and, furthermore, if any of said trees, plants, cuttings, grafts, buds, or scions are found infested with insect pests, fungi, blight, or other diseases injurious to fruit or to fruit trees, or other trees or plants, they shall be disinfected and remain in quarantine until the quarantine officer of the State Board of Horticulture or the duly commissioned quarantine guardian can determine whether the said trees, plants, cuttings, grafts, buds, or scions are free from live, injurious insect pests or their eggs, larvæ or pupæ or fungous diseases before they can be offered for sale, gift, distribution, or transporation. All persons or companies are hereby prohibited from carrying any trees, plants, cuttings, grafts, buds, or scions from without the state to any point within the state beyond the nearest point on its line or course to the quar-

antine station in the district of ultimate destination; or from any point within the state to any other point therein, until such trees, plants, cuttings, grafts, buds, or scions have been duly inspected, and, if required, disinfected as hereinbefore provided: and all such shipments must be accompanied by the proper certificate of the inspecting officer; *provided however*, that after such persons or company have given the proper officer four days' notice, he or they shall not be required to hold such shipments further, without directions from such officer.

Rule 3—All peach, nectarine, apricot, plum, or almond trees, and all other trees budded or grafted upon peach stocks or roots, all peach or other pits and all peach, nectarine, apricot, plum, or almond cuttings, buds, or scions, raised or grown in a district where the "peach yellows" or the "peach rosette" are known to exist, are hereby prohibited from being imported into or planted or offered for sale, gift, or distribution within the State of Oregon.

Rule 4—All trees, plants, cuttings, grafts, buds, scions, seeds, or pits arriving from any foreign country found infested with insect pests or their eggs, larvæ or pupæ or with fungi, or other disease or diseases hitherto unknown in this state, are hereby prohibited from landing.

Rule 5—Fruit of any kind grown in any foreign country, or in any of the states or territories, found infested with any insect or insects, or with any fungi, blight, or other disease or diseases injurious to fruit or fruit trees, or to other trees or plants, is hereby prohibited from being offered for sale, gift, or distribution within the state.

Rule 6—Any boxes, packages, packing material, and the like, infested by insect or insects, or their eggs, larvæ or pupæ, or by any fungi, blight, or other disease or diseases known to be injurious to fruit or to fruit trees, or to other trees or plants, and liable to spread contagion, are hereby prohibited from being offered for sale, gift, distribution, or transporation until said material has been disinfected by dipping it in boiling water and allowing it to remain in said boiling water not less than two minutes; such boiling water used as such disinfectant to contain, in solution, one pound of concentrated potash to each and every ten gallons of water.

Rule 7—All trees, plants, grafts, cuttings, buds, or scions may be disinfected by dipping in a solution of three fourths of a pound of whale-oil soap (eighty per cent) to each and every gallon of water; said whale-oil soap solution shall be kept at a temperature of one hundred to one hundred and fifteen degrees. Said trees, plants, cuttings, grafts, buds, or scions shall remain in said solution not less than two minutes. After said trees, plants, cuttings, grafts, buds, or scions have been disinfected they shall remain in quarantine fourteen days, unless otherwise directed by the inspecting officer, for subsequent inspection, and if deemed necessary by the quarantine officer of the State Board of Horticulture, or a duly commissioned quarantine guardian, for further disinfection.

Rule 8—All trees, plants, cuttings, grafts, buds, or scions may be disinfected by fumigation with hydrocyanic acid gas, as follows: Said trees, plants, cuttings, grafts, buds, or scions shall be covered with an air-tight tent or box, and for each and every one hundred cubic feet of space therein,

one ounce of (C. P.) cyanide of potassium (ninety-eight per cent), one fluid ounce of sulphuric acid, and two fluid ounces of water shall be used. The cyanide of potassium shall be placed in an earthenware vessel, the water poured over the said cyanide of potassium, afterward adding the sulphuric acid, and the tent or box to be immediately closed tightly, and allowed to remain closed for not less than forty minutes. After said trees, plants, cuttings, grafts or scions have been treated with hydrocyanic acid gas as above directed, they shall remain in quarantine for fourteen days, unless otherwise directed by the inspecting officer, for subsequent inspection, and if deemed necessary by a member of the State Board of Horticulture, or the quarantine officer of said board, or a duly commissioned quarantine guardian, for subsequent disinfection.

Rule 9—All trees, plants, cuttings, grafts, buds, or scions imported or brought into the state shall be inspected upon arrival at the quarantine station in the district of final destination, and if found infested with any injurious insects or diseases which can not be destroyed by the remedies required in Rules 7 and 8 of these regulations, are hereby prohibited from being planted or offered for sale, gift, or distribution, and shall be proceeded against as a nuisance.

Rule 10—If any person or persons having, in their possession trees, plants, cuttings, grafts, buds, scions, seeds, or pits infested with an insect or insects, or with any fungi, blight or other disease or diseases injurious to fruit trees, or to any other trees or plants, shall refuse or neglect to disinfect the said trees, plants, cuttings, grafts, buds, scions, seeds, or pits as is required by Rules 7 and 8 of these regulations, after having been notified to do so by a member of the State Board of Horticulture, the quarantine officer of said board or a duly commissioned quarantine guardian, the said trees, plants, cuttings, grafts, buds, scions, seeds, or pits shall be declared a public nuisance, and shall be proceeded against as provided by law.

Rule 11—Animals known as flying fox, Australian or English wild rabbits, or other animals or birds detrimental to fruit or fruit trees, plants, etc., are prohibited from being brought or landed in this state, and, if landed, shall be destroyed.

Rule 12—Quarantine stations: For the first district, comprising the counties of Multnomah, Clackamas, Yamhill, Washington, Columbia, Clatsop, and Tallamook, shall be Portland. W. K. Newell, quarantine officer, or any member of the board or the secretary thereof. For the second district, comprising the counties of Marion, Polk, Benton, Linn, Lincoln, and Lane, shall be Salem. L. T. Reynolds, quarantine officer, or any member of the board or the secretary thereof. For the third district, comprising the counties of Josephine, Coos, Curry, Douglas, Jackson, Lake, and Klamath, shall be Ashland. A. H. Carson, quarantine officer, or any member of the board or the secretary thereof. For the fourth district, comprising the counties of Morrow, Wasco, Gillman, Crook, and Sherman, shall be The Dalles. Emile Schanno, quarantine officer, or any member of the board or the secretary thereof. For the fifth district, comprising the counties of Umatilla, Union, Baker, Wallowa, Malheur, Grant, and Harney, shall be Milton and Pendleton. Judd Geer, quarantine officer, or any member of

the board or the secretary thereof. At all stations such other quarantine officers as may be from time to time appointed by the board, notice whereof will be given, and complete lists of whom may be obtained from the secretary or any member of the board.

Rule 13—Importers or owners of nursery stock, trees or cuttings, grafts, buds, or scions, desiring to have such nursery stock, trees, plants, cuttings, grafts, buds, or scions inspected at points other than regular quarantine stations may have such inspection done where required; *provided however*, that such importers shall pay all charges of inspection; such charges and expenses to be paid before a certificate is granted. Transportation companies or persons and consignees or agents shall deliver and cause to be detained all nursery stock, trees, plants, and fruit at one or the other of the quarantine stations, for inspection, as provided by the rules and regulations of the board.

Rule 14—The fee for the inspection of apple, pear, plum, peach, nectarine, prune, cherry, apricot, nut-bearing trees, and all other trees, shrubs, or plants, shall be as follows: Thirty cents per hour, including the time from leaving home, inspection and return home of the inspector, and actual traveling and other expenses. On all fruits the fee for inspection shall be $1.00 on any sum up to $35, and $2.00 on any sum over that amount, and $5.00 for car-load lots.

Rule 15—All persons growing nursery stock, trees, and plants for sale, or to be offered for sale, are hereby required to report to the commissioner of the district in which said nursery stock, trees, or plants are grown for inspection during the months of September, October, or November of each and every year; and the commissioner of such district, or his duly appointed deputy, shall inspect such nursery stock, trees, or plants prior to shipment and delivery. When said nursery stock, trees, or plants are found by said inspecting officer to be worthy of a certificate setting forth the freedom of such nursery stock, trees, or plants from live, injurious insect pests, their eggs, larvæ, pupæ or fungous disease, the said inspecting officer shall then issue to the owner or owners of said nursery stock, trees, or plants a certificate of inspection. The condition under which this certificate is granted is, that the party or parties receiving such certificate shall be compelled to disinfect by fumigation with hydrocyanic acid gas, as described in Rule 8, all pear and apple trees, or other stock grown on apple roots, after lifting the same and before delivery to puschaser or carriers; and, in case such fumigation is neglected, said certificate of inspection shall be void and of no effect.

Passed at a meeting of the State Board of Horticulture at Portland, Oregon, April 3, 1895, and amended at a regular meeting of the State Board of Horticulture at Salem, Oregon, October 15, A. D. 1895.

ANNUAL REPORT OF THE PRESIDENT.

APRIL, 1901.

To the State Board of Horticulture—

GENTLEMEN: I can not ascertain that any formal report of your chairman to this meeting is contemplated by our horticultural law. However, as he is intrusted with the supervision of the work of the commissioners, suggestions may not be out of place. Secretary Dosch having been appointed Superintendent of the Oregon exhibits at the Pan-American Exposition, I very reluctantly accepted his resignation, and upon his recommendation appointed Mr. George H. Lamberson, secretary *pro tempore*. Of this action you were duly advised. Mr. Lamberson's appointment expires to-day, and it will be necessary for you to make further provision for filling the vacancy caused by Superintendent Dosch's resignation. Several applications have been received for appointment as secretary, and these are now laid before you.

I also submit a form to be used by you in future orchard inspection, if it meets your approval. By using this form we will have more definite information as to the ownership, location, condition, acreage, and varieties of fruit grown in the state. It is eminently desirable that we have more data upon these subjects. On April 23 I attended a meeting of representative fruit growers at La Grande, where an organization was effected and arrangements made for the construction of a large two-story fruit house, built of stone. On Saturday, the 6th instant, I also addressed a large meeting of horticulturists at Milton, and endeavored to impress upon them the advantage of organized over individual efforts. The sentiment was unanimous in favor of incorporating a cooperative fruit union, and preliminary steps were taken to that end.

The fruit industry of Oregon is rapidly developing, and all the nurseries of the state, so far as I can ascertain, are bare of desirable varieties of trees.

I look forward to much benefit to accrue to our fruit growers from the enforcement of the pure food law of our last

3-YEAR WAGNER APPLE TREE, IN ORCHARD OF SEARS & PORTER, HOOD RIVER, OREGON.
BOX OF APPLES PICKED FROM SAME SOLD FOR $2.00.

legislature, and are confident that Commissioner Bailey will ultimately prevent the importation into this state of acid vinegars, of jellies, jams, and other compounds deleterious to health and falsely sold as fruit products. The enforcement of this law will create a demand for pure food preparations that our horticulturists ought to fill to their advantage.

To raise fruit with profit I am convinced that the following conditions must be complied with: *first*, commercial fruit must be of a high standard of excellence; *second*, the package must be attractive, and an honest one; *third*, the producer must have an intelligent knowledge of the markets. I am satisfied that local unions are of great business (as well as educational) value, and I recommend that you provide such organizations at centers of fruit production.

The commissioners of the board during the past year have performed a large amount of labor considering the means at their disposal and the extent of their respective districts. You have done much to prevent the ravages of insect pests and the sale of infested fruit; but our horticultural laws relating to these subjects will never be fully enforced until we have an efficient paid inspector in each fruit-growing county of the state. I invite you to discuss fully the methods to be pursued during the present year, in order to make the work of the board of the greatest value to our fruit-growing industry.

E. L. SMITH,
President Oregon State Board of Horticulture.

ANNUAL REPORT OF THE PRESIDENT.

APRIL, 1902.

GENTLEMEN: We have convened at this date in order to compare the past year's experiences and discuss methods for improved work the ensuing season. In 1901 we harvested the most valuable fruit crop ever grown in the State of Oregon, aggregating in value $2,375,000. The commissioners of our State Board of Horticulture, the professors of the Hatch Experiment Station, at Corvallis, and the press, contributed materially in securing this grand result.

It is also gratifying to note that our fruit exhibit at Buffalo secured first recognition, as, in addition to the much-coveted Wilder Medal of the American Pomological Association, we were awarded by the Pan-American Exposition 87 medals and 22 honorable mentions. Our fruit exhibit was dwarfed in extent by that of othor states, but its superb quàlity elicited the unqualified admiration of all visitors.

There is an increasing demand for our high-grade apples in Europe, and our former president, now Consul Miller in Manchuria, is confident that with low transpacific freight charges which we have reason to believe can be secured, we will be able to send our Oriental neighbors large quantities of our second grade apples.

In 1900 the apple crop was exceedingly large in the United States, yet we received satisfactory prices for our fancy fruit, as I believe we will continue to do, and if we can unload in China and Japan our second grades, the future success of our orchardists seems assured.

Our horticulturists are fast becoming convinced that to always have a market they must have the best in the market, and that these results can be secured only by planting a few varieties of high quality and then properly growing them. The apple acreage of the state is rapidly increasing, especially in Southern and Eastern Oregon, and the nurserymen inform us that the demand has been largely for Newtonws, Jonathans, Spitzenburgs, and a few other varieties, all of the highest quality.

Our prune growers also have done fairly well, new markets have been found, and the superior excellence of our Oregon product is fast becoming recognized.

The demand for information and spray bulletins is large, and my table is burdened with inquiries, not only from our own citizens, but from those of other states as well. On the whole we can congratulate ourselves that the outlook is encouraging, and that fruit growing is rapidly becoming one of the promising industries of our resourceful state.

It is my earnest desire that this board of horticulture shall give intelligent direction to this industry by popularizing all best known methods, and by cordial co-operation with the experienced grower in the field and the specialist in the laboratory.

Our transportation companies are lending their assistance by reporting to our secretary all shipments of trees grown

outside our state, and to whom consigned, thereby enabling us to secure prompt and rigid inspection, and in some instances entire car lots of infested trees have been condemned. The nursery is the fertile source of distribution of insect pests and disease, and, as in the past, I urge their frequent and thorough examination; and right here our horticultural law is sadly deficient. I refer to that portion relating to inspection. As you are aware the total allowance of the state for all horticultural work is only $4,500 per annum, and this must cover the entire work of our board, including per diem and expenses of six commissioners, salary of secretary, printing of bulletins, attending fruit meetings, etc. As a result a commissioner can inspect annually only a portion of his district, embracing several counties.

The statute provides for the appointment of deputy inspectors, but makes no provision for their compensation. We ought to have an inspector in every fruit-growing county in the state, to be paid only when called upon to inspect shipments of trees and fruit, and where special complaint has been lodged of an infested orchard.

Car loads of moth-infested apples have been shipped out of this state and sold as Oregon apples, greatly to our discredit. A small additional appropriation, with authority to pay deputies, would enable our board to secure vigilant inspection at all important points of shipment.

A new spray bulletin should be prepared, as the old one is exhausted and some of the formulas need modification.

I again call your attention to the value of co-operative organizations at central points of fruit production. Such organizations are of great educational as well as business value, and secure better results than can be obtained through isolated individual effort.

We are witnessing the beginning of a great westward movement of people to the Pacific Coast. Oregon, with vast territorial area and varied resources, will attract a large portion of this immigration. With less than ten per cent of our available fruit lands now utilized for that purpose, with constantly enlarging markets and better known methods of orcharding, what more inviting field for the new homeseeker than that of holticulture.

E. L. SMITH,
President.

REPORT.

To the Honorable the Legislative Assembly of the State of Oregon—

GENTLEMEN: In conformity with the provisions of section 12, horticultural law of the State of Oregon, I beg leave to submit the seventh biennial report of the State Board of Horticulture, embracing the years 1901 and 1902.

E. L. SMITH,
Chairman of Board.

REPORT OF COMMISSIONER AT LARGE.

To summarize results of the past two years, to briefly review the work of the commissioners during the year 1902, to point out horticultural conditions as they exist in our state at the present time, and discuss needed changes in our horticultural laws is the object of this report. For detailed operations of the board, you are respectfully referred to the accompanying semiyearly reports of the commissioners for the five horticultural districts into which the state is divided.

The fruit harvest of 1901 was the most valuable ever gathered in the State of Oregon, amounting in the aggregate, as near as can be possibly ascertained, to $2,375,000. This estimate does not include the small orchards, or the large quantity canned, dried and preserved for domestic family use. Our prune crop for 1901 was very large, but owing to the accumulation of immense quantities of dried prunes in California, the markets were depressed and unsatisfactory prices realized, and this lessened to a considerable extent the aggregate value of fruit production for the year.

The enviable reputation acquired by our fruits abroad during the year is worthy of mention. Horticultural Hall at the Pan-American Exposition contained far more fruit than was exhibited at the Columbian Exposition at Chicago. Near by states brought hundreds of barrels that had been placed in cold storage the previous fall, and, so far as quantity was concerned, our Oregon exhibit seemed dwarfed by the many-

fold larger ones by which it was surrounded. I do not think that so small a sum as one hundred dollars was expended by our Oregon commissioners for fresh fruit. Magnificent indeed were our forestry, mineral and agricultural exhibits, the two former incurring great expense to collect and transport to Buffalo, but to our fine fruits was awarded a greater number of medals than to all the other Oregon departments combined—

Total gold medals awarded to Oregon	27
Gold medals awarded to horticultural exhibits	18
Silver medals to all exhibits	33
Silver medals awarded to horticultural exhibit	18
Bronze medals to all exhibits	75
Bronze medals to horticultural exhibits	51

Total of all medals awarded to Oregon, 131; total of all medals awarded to horticultural exhibits from Oregon, 87. Of still greater value to our state than the 87 medals awarded by the committees of the Pan-American Exposition was the winning of the Wilder Medal of the American Pomological Society for our general exhibit in Horticultural Hall. The American Pomological Society is composed of the most eminent pomologists in the United States, and is the highest horticultural authority in this country, and, probably, in the world; and this recognition of the surpassing excellence of our Oregon fruits was the greatest honor they ever received.

I pass rapidly in review of the commissioners reports for the past year.

FIRST DISTRICT.

Comprises the counties of Multnomah, Clackamas, Yamhill, Washington, Columbia, Clatsop, and Tillamook. W. K. Newell, Commissioner, Dilley, Oregon.

Commissioner Newell reports the value for 1902—

Small fruit, fresh, canned, and preserved	$ 275,000
Prune crop	120,000
Grapes	25,000
Apples	65,000
Pears	10,000
Total value of crop	$ 495,000

Unfavorable weather badly damaged the cherry crop. The Lambert cherry Mr. Newell regards as the most valuable in his district, blooms late, is of good size and quality, and bears shipment well.

SECOND DISTRICT.

Comprises the counties of Lincoln, Marion, Polk, Benton, Linn, and Lane. Lloyd T. Reynolds, Commissioner, Salem, Oregon.

Mr. Reynolds files an interesting report, discourses wisely and well as to the importance of co-operative fruit organizations, without which best results can not be obtained. He also emphasizes the value of nursery inspection and also the case of a shipment of two car lots, about 45,000, badly infested peach trees from Pennsylvania. These trees were quarantined and consignors notified that they must be reshipped or disinfected, but failing to do this, the entire lot was burned.

The value of fruit and fruit products for the biennial period covered by the report was as follows :—

	1901.	*1902.*
Prunes	$ 225,000	$ 200,000
Cherries	60,000	10,000
Pears	6,000	5,000
Apples	58,000	100,000
Other fruits and fruit products	33,000	100,000
	$ 382,000	$ 415,000

THIRD DISTRICT.

Comprises the counties of Jackson, Douglas, Klamath, Coos, Curry, and Lake. A. H. Carson, Commissioner, Grants Pass, Oregon.

As usual, Mr. Carson files a full and interesting report. Mr. Carson during the years 1901 and 1902 received and answered 400 letters, distributed 350 copies of sixth biennial report and large numbers of our spray bulletin, served upon owners of infested orchards 250 notices, and visited 350 orchards.

The third district produced in the past two years—

Apples	300,000 boxes
Pears	160,000 boxes
Peaches	160,000 boxes
Prunes, cured	800,000 pounds
Apples, cured	200,000 pounds
Peaches, cured	150,000 pounds
Small fruits to the value of	$ 60,000
Estimated value of crop for the two years	703,000

Jackson County has twenty-five gasoline power spraying outfits which do the work more thoroughly and lessen the cost fifty per cent. Fifteen hundred acres were planted in the third district last fall and spring.

FOURTH DISTRICT.

Comprises the counties of Wasco, Morrow, Gilliam, Crook, and Sherman. R. H. Weber, Commissioner, The Dalles, Oregon.

Mr. Emile Schanno for many years was commissioner of this district. He was a pleasant gentleman, a devoted horticulturist, and a faithful servant of the state. His death occurred in the fall of 1901, but it was not until June 13 of the present year that the vacancy was filled by the appointment of Mr. R. H. Weber of The Dalles, who was recommended by the fruit growers of that vicinity as their choice for commissioner. Mr. Weber is a fruit grower and nurseryman, and will make an acceptable and efficient member of the board. Mr. Weber reports that the directions of the board are carefully followed in his district, and highly valued.

The fruit harvest in his district for the year 1902 was approximately as follows :—

Apples	250,000 boxes
Crab apples	1,500 boxes
Pears	25,000 boxes
Peaches	65,000 boxes
Apricots	3,000 boxes
Nectarine	300 boxes
Cherries	65 tons
Prunes	750 tons
Plums	200 tons
Currants	3 tons
Gooseberries	5 tons
Strawberries	65,000 crates

At ruling prices the crop will amount to $450,000, one half of which will go to Hood River Valley.

FIFTH DISTRICT.

Comprises the counties of Umatilla, Union, Baker, Wallowa, Malheur, Grant, and Harney. Commissioner, Judd Geer, Cove, Oregon.

Commissioner Geer during the past year has visited 450 orchards, 500 copies of the report were distributed, and large numbers of spray bulletins, and has traveled over 4,500 miles. Everywhere bulletins have been eagerly sought. In this fifth district are about 3,700 acres in commercial orchards and the output for the year 1902 was as follows :—

Apples	250,000 boxes
Prunes, fresh	20,000 boxes
Prunes, cured, value	$10,000
Pears	15,000 boxes
Peaches	30,000 boxes
Strawberries	18,000 crates
Cherries	27,000 cases

In addition, a large amount of blackberries, raspberries, grapes, etc. Total value of commercial crop at a low estimate $250,000; to them should be added $50,000 for small orchards and a large amount for domestic use, making in all $300,000, the value of crop. Mr. Geer reports that there is a wonderful activity in the sale of fruit lands, and in planting of new orchards in Grand Round Valley and the irrigated portions of Malheur county.

The Exposition at Charleston, South Carolina, was a repetition of our success at Buffalo, our department of horticulture and pomology receiving 34 gold medals, out of a totol of 64, for all Oregon exhibits.

The edition of Spray Bulletin No. 1 having been exhausted, and the demand constant, I compiled Bulletin No. 2, embodying the best experience of our own and other states. The San Jose scale is the most dreaded enemy of our fruit growers and is found on several of our native shrubs as well as in our orchards.

Annual spraying, while trees are dormant, will practically eradicate it unless in vicinity of native shrubbery infested with it. The formula generally used is known as the "lime, sulphur and salt" remedy. The sulphur and the lime are the effective agents in this compound, so far as killing the scale is concerned; the salt simply rendering the mixture more adhesive. In Bulletin No. 2, formula No. 4, I have reduced the amount of salt one half. Since compiling this bulletin I have been convinced that it will be better to leave out all the salt and substitute 4 pounds of bluestone (sulphate of copper) to 150 gallons of the spray mixture. This will serve a double purpose (as fungicide as well as insecticide), and I recommend its general use as the most approved remedy for the scale and fungus spores. Professor Foster, entomologist of the State of Illinois, has made thorough tests as to the relative efficiency of these two sprays. Living scales were counted in several trees, and the two sprays applied on the same day. It was found the spray containing the sulphate of copper not only destroyed a greater percentage of scales, but that it was also less injured by rains, and that its full effects were reached in five days.

Anthracnose, or as it is more generally known "dead spot" or "apple canker," is a dreaded fungous disease, in many instances destroying entire orchards. Commissioner Carson's

6-YEAR-OLD PEAR TREE IN ORCHARD OF SEARS & PORTER, HOOD RIVER, OREGON.

STRAWBERRY PLANTATION OF F. A. JONES, ON WEST FORK OF HOOD RIVER, OREGON—1902.

DISTANT VIEW OF BEULAH LAND, E. L. SMITH'S ORCHARD HOME, HOOD RIVER, OREGON.

power to appoint, but none to pay inspectors. What we need is an inspector in every considerable fruit growing county of the state, whose duty shall be to see that the quarantine regulations of the board are enforced.

The inspectors would be required to devote only a small portion of their time to the work of inspection and their compensation would be nominal. An additional $1,500 yearly, with authority to pay inspectors, would lessen the traveling expenses of the commissioners, would guard the principal points of domestic consumption, and of import and export, would lessen the liability of the introduction of new diseases and insect pests, would give the consumer sound, healthy fruit, would encourage and compel our orchardists to practice best known methods and prevent the utter demoralization of the markets by a flood of diseased infested fruits, fit only for the crematorium. There has been a marked improvement in fruit culture during the past two years. The scientist is no longer ridiculed, and doubt has been followed by conviction as to the utility of modern methods. The spray pump has become universal in all commercial orchards, and small motors relieve the weary arms at half the former expense for spraying.

The experiment stations, the farmers' institutes, the board of horticulture, and especially the press, have been carrying on an educational work invaluable to the fruit grower.

A survey of the state has been made by the commissioners, and nine tenths of the lands of Oregon adapted to the growth of fruits are yet unoccupied by orchards. Careful estimates of the market value of our fruit products for the past two years show that they exceed $4,000,000, and the area of our orchards is rapidly increasing. An industry of this magnitude, an industry that subdivides large holdings of land and enhances its value from $20 to $500 per acre, that builds numberless homes, and contributes so greatly to the comfort of all our people, an industry of almost unlimited possibilities, is indeed worthy of the care and support of the state.

E. L. SMITH,
Commissioner at Large.

Hood River, Oregon, December, 1902.

REPORT OF THE COMMISSIONER.

FIRST DISTRICT.

SEMIANNUAL REPORT, APRIL, 1901.

DILLEY, Oregon, April 8, 1901.

To the President and Members of the State Board of Horticulture—

GENTLEMEN: I herewith submit my quarterly report for the term ending April 8, 1901. At the present time the outlook for the fruit crop for the coming season is most promising. The fruit buds are strong and well developed and in plentiful quantities on the trees. Nothing has bloomed yet, save peaches and a few early cherries, so the cold rains and frosts of the past two weeks have done no injury worth mentioning. The entire winter season has been most favorable, and trees that have been properly cared for are in the best of condition.

There has been a notable increase in the planting of trees this season, particularly of apples and prunes. The prune planting is almost entirely of the Italian, the general conclusion being that there is no profit in growing the Petite. Nursery stocks of Italian prunes are almost entirely exhausted, and prices received were very good, choice yearlings selling as high as 12½ cents by the hundred. In spite of discouraging features in the market outlook, the demand for prune trees bids fair to continue strong for some time yet. But the largest plantings are of apples, particularly such varieties as Gravenstein, Jonathan, Spitzenburg, Rome Beauty, and Yellow Newtown. Stocks of these varieties were exhausted early in the season, and it is quite probable that nurserymen will be unable to supply the demand the coming season.

One branch of the fruit industry is, curiously, almost entirely neglected in Western Oregon, and that is growing the winter pears. There has scarcely been a pear in the Portland market since Christmas. I remember having seen only one small lot, and as they were of an unfamiliar variety, I purchased a couple to taste, and truly they were worse than the much-abused Ben Davis apple. I asked the dealer about

them and he said they were all he had or was likely to have until next summer. Now, it seems this state of affairs should be remedied. Certainly winter pears will grow here, and, more certainly still, people will be glad to buy choice Anjou, Winter Nellis, or Buerre Easter pears at fancy prices.

Each season shows an increase in the quantity of spraying done, and not only in the quantity but also in the quality of the work. Of the serious pests, San Jose scale keeps spreading, though slowly, but is much less in localities where it was formerly the worst. Continuous spraying seems the only method of keeping this pest in check. Apple canker, or anthracnose, was not so bad as last season, but is still a serious disease and one that requires close watching.

I have succeeded in having quite a number of old orchards entirely removed, and much more should be done in this line if only we had the power. In the vicinity of Portland there are numerous old trees on unfenced property, the owners of which it is impossible to find, and it seems we should have the authority to have these trees removed, but the Attorney-General holds that we must notify the owners, leaving us powerless in the matter.

The sixth report of the board has been most cordially received, and the demand for it is large. I have already sent out over a hundred copies, and every mail brings new requests.

The outlook for fruit growers was never brighter than at present.

WILBUR K. NEWELL.

SEMIANNUAL REPORT, OCTOBER, 1901.

DILLEY, Oregon, October 14, 1901.

To the President and Members of the State Board of Horticulture—

The season of 1901 has been, in spite of many drawbacks, a fairly prosperous one to the Oregon fruit grower. Particularly is this true of the growers of small fruits. The prices of all kinds of small fruits have been better maintained throughout the season than during any season for several years. This is partly due to the steadily increasing demand, but also largely to the fact that the large centers are well equipped with canneries ready to take up everything offered at a living price, thus preventing ruinous glutting of the

market and consequent loss and discouragement. There is room for great expansion of the canning industry in the Willamette Valley. Nowhere in the world do finer strawberries, blackberries, raspberries, etc., grow. Every requisite is at hand save the necessary energy to develop the industry. The canneries already in operation have proven that we can and do produce the very finest grade of canned fruits.

It is encouraging to note that the strawberry growers of Salem are attempting to form a union similar to that of Hood River, and it is to be hoped they will be as successful. Newberg and Canby are two points in my district most excellently adapted to the growing of strawberries. They are already grown at both these points in considerable quantities, and a steadily increasing acreage should soon be followed by formation of a union, and then the building of a cannery. For, though there may and probably always will be times of depression and loss in the fresh fruit market, the fruit can always be canned, jammed, or preserved and sold at a fair profit. Jams and jellies from California and from England are constantly on sale in our markets. To my mind here is the most promising field for development of the fruit industry in Oregon at the present time.

The prune drying season is just drawing to a close and the crop now saved is the largest on record, though it is yet too early to obtain accurate figures of the total yield. I estimate the crop of my district at from 225 to 250 cars, almost entirely Italian; but very few Petites have been dried this year; they have become so small as to be worthless. The new Sugar prune is promising, and Petites may be grafted to that variety. At present prices for prunes are very low, but it is to be hoped that the market will rally and at least fair prices be secured.

The apple crop is short and prices for choice stock are very high. While the codling moth has been prevalent as usual, there seems to have been less trouble than usual with scab and bitter rot.

The nurseries are in excellent condition, and report active demand for trees, particularly apple and cherry.

On the whole, conditions are encouraging and the prospect bright.

WILBUR K. NEWELL.

SEMIANNUAL REPORT, APRIL, 1902.

DILLEY, Oregon, April 14, 1902.

To the President of the State Board of Horticulture—

The outlook for the fruit grower for the coming season is at present very bright. We are having one of those backward springs that are the joy of the fruit grower's heart. The cold rains, snows, and frosts of the past week or ten days have no terrors for us while the fruit is not yet in bloom. The season is fully two weeks later than the average, and blooming will now certainly be so late that there can be little danger of cold rains or frost. Fruit trees generally are heavy laden with strong, well developed fruit buds, and give every promise of a good yield, and never before has there been so much thorough and effective spraying done as has been accomplished this spring. In the past so much spraying has been so poorly done that it had just as well have been left undone; but to do good work is something that has to be learned by experience, and the majority of fruit growers are learning from their own and others' failures.

The San Jose scale in my district is still mainly confined to Multnomah County, in the vicinity of Portland, with a little at Milwaukee, Oregon City, and Hillsboro. While it is manifestly impossible to completely stamp out this pest by artificial means, it is possible and practicable to hold it in check so that little or no damage will result therefrom. The "lime, sulphur and salt" spray, so long recommended by the board, is unquestionably the most efficient and the safest compound to use, and should always be applied during the winter or early spring, when the trees are dormant. It is merely a waste of time to attempt spraying for scale in the summer time, as the foliage prevents the spray from reaching the limbs and twigs where the scale is. This lime, sulphur and salt spray is now being generally adopted throughout the Eastern States, where it was so long claimed that it was not efficient. The fruit growers of Oregon owe a great debt to our lamented brother commissioner, Emile Schanno, for his earnest labor in experimenting with and perfecting this spray, for he, more than any other man, was responsible for the compounding of it and the demonstration of its efficiency.

The Oregon Experiment Station has just issued a bulletin, from the pen of Prof. A. B. Cordley, on the codling moth, that gives all the latest information about this pest, which he

rightly calls the worst enemy of the apple grower. This bulletin should be in the hands of every fruit grower, as it tells just how to detect the eggs upon the fruit, thus giving timely notice of when to spray. It also gives the best formulas for sprays and instruction for preventing scabby apples and pears. It is the best treaties that has yet appeared on the subject.

There has been a very heavy demand for apple trees for planting this season, with good market for other trees, particularly prune and cherry, and nursery stocks are practically exhausted; and beside there have been heavy shipments into the state from the outside. With the present prospect for a world-wide market for our apples there does not seem much danger of greatly overdoing the apple planting business, though of course we can not often expect such prices as we have received this year. Even the much abused Ben Davis is going to prove useful and valuable for shipment to the Orient. I am inclined to think that it is about the only apple, save the Yellow Newtown, that will successfully stand shipment to the eastern countries. The latter is too high priced an apple for some markets, and the area in which they can be grown is too limited ever to make them very cheap, so that the former is the only resource, and I believe that to choose between Ben Davis and nothing that most people would choose Ben Davis. They can be grown anywhere, and so cheaply that they can be placed in the Oriental markets at a price they can easily pay, and still be very profitable here.

With a favorable year the prune crop will probably be a little larger than that of last year. Prices should rule good as the surplus both in California and at home promises to be well cleaned up ere the new crop comes on the market.

It is encouraging to note the increase of interest that is being taken in the growing of strawberries, especially around Newberg. There several men are putting out large patches, and many more are preparing to grow plants for next year's planting. Steps are being taken to form a union there similar to the ones at Hood River and Salem, to handle the crop when it is produced. They are also endeavoring to have a cannery or preserving plant established there. This latter seems to me the most promising plan; there are many and serious difficulties in the way of successful shipping of fresh berries from the Willamette Valley, but with a jam plant or a cannery the question is a simple one from the growers' standpoint, at least. Such a plant can well afford to pay 3 or 3½ cents per pound, and

with an assured and unlimited market the grower can do a profitable business at those figures; and surely no place on earth can grow finer or cheaper strawberries than the Willamette Valley. I confidently expect to see the Willamette Valley grow to be the leading source of supply for the world of all kinds of jams, preserves, etc., of all such fruits as strawberries, raspberries, blackberries, currants, etc.

The opportunity is ours, let us grasp it.

W. K. NEWELL.

FINAL REPORT, OCTOBER, 1902.

DILLEY, Oregon, October 13, 1902.

To the President of the State Board of Horticulture—

I herewith submit my report for the quarter ending October 13, 1902. The season of 1902, though in its early months not very encouraging to the fruit growers of my district, is making a better final showing than might have been expected; the fine quality of the fruit and the increased prices, in some degree, compensating for the reduced yield.

The strawberry crop was very much short of the normal, but prices were excellent compared with former seasons; the bulk of the crop bringing from 5 to 8 cents per pound. Owing to the scarcity, the canneries put up only about one third the amount of last year's pack. The planting of new vines has been very heavy and with a favorable season the crop of 1903 will be very large; but even then the growers can reasonably expect very good prices. Small fruits have for several years past been cheaper in Portland than in almost any other market in the United States,—much too cheap,—at many times below the cost of production; but it is safe to say that the day of strawberries at 2 and 2½ cents per pound are past.

The value of the crop of small fruits marketed fresh in my district is estimated at $200,000, and the amount canned at $75,000.

The nearest a complete failure experienced in any line was that of the cherry crop. The Royal Ann, the money maker, was practically ruined by unfavorable weather; but in a good year this cherry bears so bountifully and commands such good prices that it is profitable. I believe the best cherry for planting in the first district is the Lambert; being very late it will escape injury from the June rains, and it is a good and sure yielder, of fine quality and firm enough for shipping long distances.

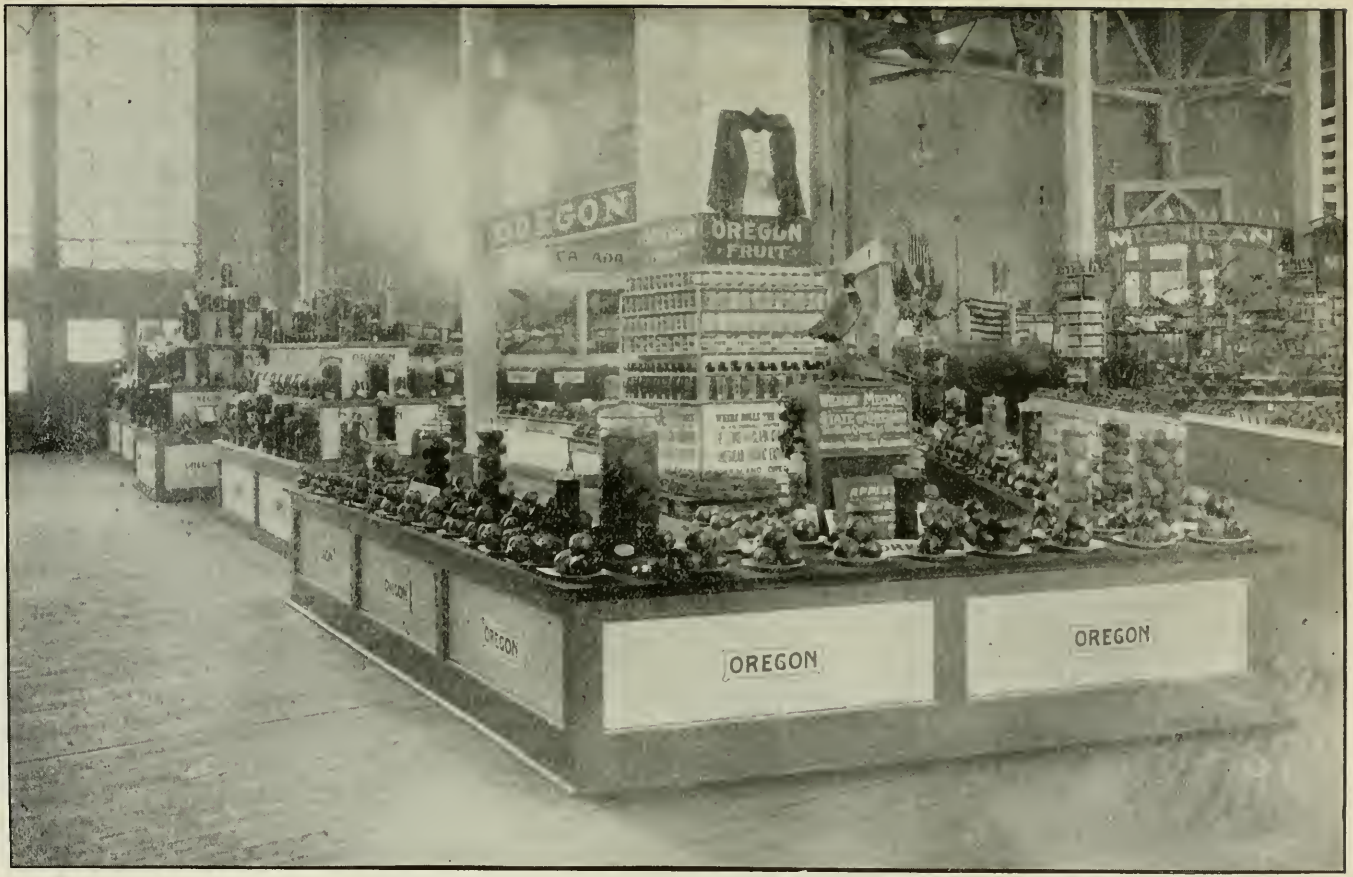


EXHIBIT OF OREGON FRUITS AT PAN-AMERICAN EXPOSITION, BUFFALO, N. Y.—1901.

PAN-AMERICAN EXPOSITION

BUFFALO·NEW YORK·A·D·1901

The Directors, on the recommendation of the Superior Jury, confer their award of

A GOLD MEDAL

on *State Board of Horticulture*,

for *Horticulture literature*.

[illegible] President

Edwin Fleming Secretary

Wm. I. Buchanan Director General

Mary S. Litchfield Superintendent of Awards

BVFFALO
VSA MCMI

PAN-AMERICAN
OREGON STATE BOARD
OF HORTICULTURE

It is yet too early to estimate accurately the prune crop, as many evaporators are not yet through the season's run, but it is approximately 3,000,000 pounds. Quality is most excellent as the fruit was well grown and the weather during the drying season has been perfect. Sizes are large and prices show some tendency to advance. Estimating them at 4 cents the value of the crop would be $10,000. The Sugar prunes made a very good showing and will doubtless supplant the Petite entirely.

The pear crop is very light, probably $10,000 in value. The apple crop is good, roughly estimated at $65,000. The grape crop, now being marketed, is most excellent and will be worth $25,000.

The total value of the season's fruit crop for the first distict will thus be about $495,000.

W. K. NEWELL,
Commissioner First District.

REPORT OF THE COMMISSIONER.

SECOND DISTRICT.

SEMIANNUAL REPORT, APRIL, 1901.

SALEM, Oregon, April 9, 1901.

To the President and Members of the Board of Horticulture—

GENTLEMEN: I submit a brief summary of the work done in the second district since our last meeting, referring you to the quarterly reports for a detailed account.

Our first work was the inspection of nurseries. The nurseries were generally in good condition, we might say excellent, considering the hundreds of thousands of trees which are grown annually. Each nursery is supplied with the necessary houses for fumigating nursery stock before shipment. The best nurserymen make it a rule to fumigate all nursery stock, and I think it would be well for us to adopt a rule requiring the fumigation of prune, plum, peach, and other fruit trees, as well as the apple and pear trees.

A number of shipments of apples were inspected, and in a few cases it was necessary to condemn fruit prepared for ship-

ment. It is a matter of regret that a number of cars of apples were shipped from Oregon during the past Winter without inspection, for a single car of infected fruit can do more damage to the reputation of our fruit growers than ten cars of choice fruit can repair. Our most progressive growers and packers are working faithfully to establish a reputation for high-class Oregon fruits, but there are those who do not hesitate to swindle the public by facing boxes of small prunes with large, fine ones, or by packing the middle tiers of apples with culls.

While it is impossible to absolutely guard against the sale of infected fruit in a local way, owing to the large number of retail stores in all parts of the district, yet through occasional visits and letters much was done in this regard, the fruit sold at retail being far better than usual. The restriction of the sale of infested fruit in the local market is having a beneficial effect on the more careless class of farmer-orchardists, so many having inquired for spray formulæ that my supply of bulletins has been exhausted.

A large number of owners of infested trees have been notified to spray, more than 150 notices having been served. The present outlook for a fruit crop is encouraging and if the season is favorable fruit growers should endeavor to prevent their trees carrying too much fruit, since a medium crop of choice fruit will sell at a profitable price rather than a large crop of inferior fruit. Growers should be prepared to spray when the proper time comes, for the delay of a few days may cause a large loss.

L. T. REYNOLDS,
Commissioner Second District.

SEMIANNUAL REPORT, OCTOBER, 1902.

To the State Board of Horticulture—

GENTLEMEN: I herewith submit my semiannual report for the second district. In my last report I attempted to give some idea of the size of the district, the acreage devoted to fruits and the land available for that purpose. In the present report, therefore, no attempt will be made to give a description of the territory included in this report.

The Willamette Valley has in some respects been at a disadvantage in the marketing of her fruits from the very fact that all varieties of deciduous fruits can be grown successfully.

At first glance this would seem to be a decided benefit, enabling her fruit growers to have a large and increasing trade in such fruits as would allow them to greatly prolong the shipping season. In practice, however, with the exception of prunes, the growers of the different communities have so selected their trees that they are not able to ship car loads of any single variety of fruit, whether it be cherries, pears, or apples. As a consequence, they are compelled to accept very low prices for their products because a buyer must spend too much time traveling and collecting his fruit before he can make a shipment. The remedy for this lies with the growers themselves. At every shipping point the fruit growers in the vicinity should organize an association. If their orchards are small, they should agree to top-work their trees into a few varieties which do well in their particular locality. They should study and practice the best methods in the cultivation and spraying of their orchards, endeavoring to produce perfect fruit. When fruit is produced in sufficient quantity, buyers can deal with the secretary or manager of the organization, and be assured of receiving first-class fruit of uniform pack. Better prices can then be secured, for by the present method of purchasing in small lots from the individual producer, the buyer is not sure that any two lots will grade alike. Not only is an organization an assistance in marketing the products of the orchard, but it will tend toward the production of a better quality of fruit. Each member knows his fruit must reach the required standard if he is to sell through the union, and this naturally leads to greater care on the part of the members. An association of this character should not attempt too much at the start. A very small beginning may lead to important results in a few years, while if a great deal is attempted before experience and reputation have been gained, the undertaking may be so disastrous as to discourage further efforts on the part of the growers. The advantage of such an organization when firmly established is very apparent. The individual is no longer compelled to hunt a market for his crop, as this is done for him, and if a high standard is always maintained, the demand for the product is likely to increase faster than the supply. The Hood River Fruit Union at Hood River, and the Willamette Valley Prune Association at Salem, are illustrations of successful organizations of fruit growers, the one handling strawberries and apples, the other confining its operations to dried prunes. In each case an essential factor in their suc-

cess has been the establishment and maintenance of a high reputation for quality of pack, and with each there has been an increasing demand for their products. With co-operation in the handling of the crop will come co-operation in spraying and combating insects and diseases as there will be a common interest in the welfare of the district, and it is only through continual warfare with insect and fungous pests that perfect fruit can be obtained. The establishment of canning and preserving factories, cider and vinegar factories, etc., gives the growers a market for a large amount of fruit, much of which might otherwise be wasted. The cannery located at Salem has been contracting with growers of small fruits, to take their raspberries, blackberries, and other fruits for a term of years, thus insuring them of a market.

The Loganberry has become quite common, several extensive plantings having been made. There promises to be a good demand for this berry for canning purposes. Especially is it popular for home canning, as it takes the place of the wild blackberry, which has always been highly esteemed as a canning fruit, but is becoming difficult to obtain.

During the past two years there has been a large increase in the acreage of small fruits, though there have been no large plantings of orchards. Changes can be noticed from year to year, however, which indicate that orchardists in different localities are learning what fruits are best adapted to their particular soil and elevation, and are working over their orchards accordingly, finding it most profitable to work in harmony with their natural advantages.

During the past season, a general inspection of the whole district could not be made, but we have endeavored to give attention to many cases of infected orchards. A large number of orchards were sprayed for scale insects last winter and while many of the orchards so sprayed were not entirely free from the insect this summer, there was a very noticable improvement in the condition of the trees. Certain peach orchards which were sprayed for San Jose scale with the lime, sulphur and salt spray, are reported very much benefited, the fruit being finer aud trees making a healthy growth, with no curl leaf. Though not all the scale was destroyed, the results were so satisfactory that the orchards will be given a thorough spraying again this winter. Spraying is becoming more general each year, especially in the orchards which are planted for commercial purposes. Many inquiries have been received

recently in regard to the best methods for winter spraying and it is expected there will be more of such spraying done this winter than ever before. Not enough attention, however, is being paid to the apple-tree anthracnose, for I visited several orchards during the summer in which it had done great damage. The best method of treatment seems to be to give the trees a thorough spraying with bordeaux mixture early in the fall to prevent the growth of the spores and to cut out new spots which may have started.

The greatest difficulty in connection with the enforcement of the law in regard to infested orchards, is encountered in securing the proper spraying or destruction of infested trees in small home orchards and city lots. Owners of such trees are often too careless, their spraying being ineffective and the amount of time required to supervise the work on a large number of places renders it almost impossible to secure thorough work by those not interested. A large number of notices to spray were sent out or served personally and in a majority of cases the trees indicated were sprayed, but too often the work was so poorly done as to require treatment again this year, or the destruction of the trees, which plan would probably be best for all interested. In nearly all cases where commercial orchards were found infested with scale insects or other pests, the owners have been ready to follow the directions given in the spray bulletin, and will continue to give their attention to any trees that may become infected. The complete eradication of the scale in all districts is doubtful, as it is often found on wild shrubs, but by the co-operation of all fruit growers, whose orchards may become infected, its ravages may be reduced to the minimum.

The San Jose scale is very destructive to the mountain ash and may be found on these trees in nearly every town in Western Oregon. From these trees it is carried to fruit trees by birds which gather to feed on the red berries. For this reason persons owning mountain ash trees should see that their trees are sprayed each winter with the lime, sulphur and salt spray. In this connection I wish to urge that the board should make some special provision for the enforcement of the law in the larger towns and cities, as it is here that the worst infected trees are found. If, however, the commissioner of a district devotes the necessary time to these cases very little other work could be done.

The soil and climate of the Willamette Valley seem particu-

larly adapted to the production of fine nursery stock and this has grown to be a very important business in this district. The proprietors of the nurseries are careful to keep their trees clean and free from pests, and it becomes our duty to see that their grounds are properly protected from outside infection. The Oregon Nursery Company, located at Salem, has two hundred or more acres devoted to the growth of nursery stock of all kinds, and hundreds of thousands of trees are shipped from this district to all parts of the West. The inspection of nursery stock therefore becomes an important part of the work of the commissioner of this district, particularly since many car loads of trees and seedlings are shipped in each year from the Eastern States and Europe.

During the past two years a great many shipments of trees from the East have been inspected, and, in several instances, it has been necessary to have trees fumigated or destroyed. One shipment, consisting of two car loads of peach trees from Pennsylvania, were found to be badly infested with borers, root-knot, and peach-tree aphis. These two car loads, containing about 45,000 trees, were quarantined, and the consignors notified to reship them from this state or have them properly treated for the destruction of the aphis and other pests. They neglected to fumigate or otherwise treat the trees, and, after a reasonable time, the trees were ordered burned and the entire two car loads were destroyed. The importance of preventing the introduction of the peach-tree aphis into this state may be seen from an account of their destructiveness, given in the last biennial report, page 393, from which I quote :

> Dr. Smith, who described this insect, says:
> "In Delaware, Maryland, and parts of New Jersey and Virginia this aphis was reported everywhere to be unusually prevalent and destructive. In April, when the leaf buds were pushing, I saw them cluster upon so many shoot axes and so compactly as to kill young trees, and even very considerable branches upon older trees. They were especially destructive to nursery trees and to orchards just planted. I saw one nursery in which at least one hundred thousand trees had been killed outright in two or three weeks time. I also heard of half a dozen nurseries which were entirely distroyed or very seriously affected, and of orchardists who will be compelled to replant hundreds of trees. Such trees are badly dwarfed, and make only a feeble, sickly growth. The leaves are light green or yellowish, more or less rolled at the margins, and red or purple spotted from the attack of fungi."

Few shipments of green fruits were made from this district during the past season. The cherry, plum, pear, and strawberries yielding light crops. There will be a number of cars of apples shipped and some very fine crops are reported.

That the Willamette Valley can still maintain its reputation for the production of the "Big Red Apples" is illustrated by the crop of 12,000 boxes of choice apples just picked at the Wallace orchard, two miles from Salem. In this orchard modern spraying outfits are in use, a gasoline engine being used to furnish the necessary power.

While the fruit crops, with the exception of apples, have been lighter than usual, good prices have been realized, and the year closes with the fruit growers in a hopeful frame of mind, encouraged to continue steadfast in their chosen work. When new plantations are made it is usually done by those who are already engaged in the work and are prepared to profit by the experience they have gained.

While there is a small but steady growth in the orchard acreage, I am glad to report there is no boom. It is the boom in orchard planting that occasionally occurs which is responsible for many of the troubles of those who make a business of growing fruit. When a few stories of large profits in fruit growing are published, many persons are induced to rush into the business and plant extensive orchards without previous experience. The result is usually disastrous for the too enthusiastic novice; the profits figured out hopefully on paper prove disappointing deficits in practice; the trees are neglected and become a source of danger to well kept orchards in the vicinity. There are several such orchards, planted by stock companies, in this district which should serve as warnings to those who are inclined to invest in fruit lands without previous investigation. There have been too many trees planted on lands entirely unsuitable for orchards and such places can not be made profitable.

There is a good demand for the Oregon prune this year and few will remain unsold by January 1.

The following is an estimate of the value of the fruits produced in the second district during the two years included in this report, though no claims are made for its accuracy as some of the necessary data is very hard to obtain:

ESTIMATED VALUE OF FRUITS PRODUCED IN SECOND DISTRICT.

	1901.	*1902.*
Prunes	$ 225,000 00	$ 200,000 00
Cherries	60,000 00	10,000 00
Pears	6,000 00	5,000 00
Apples	58,000 00	100,000 00
Other fruits and fruit products	33,000 00	100,000 00
	$ 382,000 00	$ 415,000 00

L. T. REYNOLDS,
Commissioner Second District.

REPORT OF THE COMMISSIONER.

THIRD DISTRICT.

SEMIANNUAL REPORT, APRIL, 1902.

GRANTS PASS, Oregon, April —, 1902.

To the President and Members of the State Board of Horticulture—

GENTLEMEN: I herewith submit my semiannual report of the horticultural industry of the third district to April, 1902.

At the present date the prospects for a large fruit crop in the third district is very promising. Fruit trees of all varieties have wintered without any damage to trees or fruit buds from climatic causes. Almond, peach, cherry, and prunes are in full bloom. The pear is beginning to bloom, while the early blooming varieties of apples the fruit buds are forming, but show no color yet. All varieties of fruit is blooming from two to three weeks later this year than last which is favorable to base prophesy for a large crop.

The fruit crop the past year, while not a record breaker, was quite large, averaging perhaps sixty per cent of a crop of all varieties, and with good prices which prevailed through the season fruit growers realized a good profit, and were successful. Their success has stimulated all classes of fruit growers to spray, prune and put their orchards in the best possible condition for this year's crop.

With experience the fruit growers find their success, if they have any, comes from an intelligent knowledge of injurious insect pests and fungous diseases, and the remedy for them. I have answered a great many letters of inquiry from all parts of the district as to the methods and remedies suggested by the state board for fighting insect pests and fungous diseases, and in visiting various localities of the district I find a great majority or orchard men active and alert to the necessity of spraying. I know of many men two years ago who had no faith in spraying for San Jose scale, whom I have induced to spray their infested orchards with the result; these men are now strong advocates of the spray pump. Their success in destroying the scale has removed want of faith.

The confidence of the fruit growers through their success

10-ACRE PRUNE ORCHARD OF W. P. JETER, 8 MILES SOUTH OF GRANT'S PASS, OREGON—1902.

PEACH ORCHARD NEAR ASHLAND, OREGON—1902.

the past year is very great as to the future of the industry. I am warranted in saying this as the planting of new orchards, especially about Ashland, Medford, and Central Point, has been large the past winter. I estimate that in the vicinity of these three localities there has been 1,200 acres planted. About sixty per cent of the new acreage is the apple and forty per cent peach and pear.

The planting of the present is on more intelligent lines than during the large planting twelve and fifteen years ago. At that time the adaptability of the soil for tree growth was not considered. It was then taken for granted that any soil would grow fruit trees and produce fine fruit of any variety the planter fancied planting. The tree planters of the present are avoiding this mistake, and now choose the best of soils for apple and pear growing. One successful apple grower near Central Point said to me during the winter: "I find no soil too good to grow the apple and pear. To get large yields and the best quality you must have the best of soil." This grower, Mr. W. H. Norcross, has an apple orchard of 21 acres of rich bottom loam that is now ten years old that has borne five crops of apples. The past season he sold 1,966 boxes of Spitzenburgs off of 404 trees, all four-tier, excepting 180 boxes five-tier, for $1.45 per box f. o. b. Four hundred Ben Davis apple trees produced 1,800 boxes, which he sold from $1.00 to $1.25 per box f. o. b.

On the same kind of soil J. W. Merrett of Central Point has 210 apple trees ten years old of Spitzenburgs, Red Cheek and Willow Twig. Mr. Merrett sold the crop on the trees, the buyer picking and packing the apples, for which he received a check for $1,249.20. I verified this sale by personally calling on Mr. Merrett. He said the amount was correct, and added that in addition to the amount of the check he made 100 gallons of cider for which he got $20, and sold in the local market 100 boxes of the best culls for $50, making a total of $1,319.20 for his crop.

In stating the profits in these two cases it must be remembered many other apple growers on larger orchards did not have Mr. Norcross' and Merrett's success, for the reason their soils were not adapted to the greatest success in apple growing, although they may have pruned, sprayed, and cultivated equally as well. In stating the profits in these cases the conditions must be intelligently understood. The demand for apples last fall was strong and prices ruled high, and, too,

the yield was large, from the fact the soil was of the best and pruning, spraying, and cultivating had been done. This being the case, to reach the greatest success in apple growing the soil must be the best. There is always a strong demand in the market for the best. There is not enough of the best in the market any year. What there is of the best always brings the producer the highest price.

The peach men of Ashland had fair crops last year which they sold at good profit. Through the kindness of Mr. G. W. Crowson, manager of the Ashland Fruit Association, I got valuable data as to the fruit sold through the association. All fruit sold is paid for on delivery, f. o. b. The association sold the following packages: 37,048 boxes of peaches sold at 45 to 50 cents; 1,497 boxes of early apples, sold one car at 95 cents; the balance of the lot sold at 60 cents and 75 cents; 91 boxes of crab apples sold at 50 cents; 129 boxes of peach plums sold at 40 cents, 15-pound boxes; 1,518 boxes of pears, 20-pound boxes, sold at 50 cents; 1,321 crates of strawberries, 15 1-pound cups, sold at $1.25; 20 crates of gooseberries, 15 1-pound cups sold at $1.00; 54 crates of currants, 15 1-pound cups sold at $1.00; 24 crates of Loganberries, 15 1-pound cups sold at $1.50; 157 crates of dewberries, 15 1-pound cups sold at $1.00; 22 crates of black raspberries, $1.50; 518 crates of red raspberries, $1.25; 2,655 crates of black raspberries, 60 cents; 591 boxes (15-pound) of black cherries 75 cents; 334 boxes (15-pound) of Royal Ann cherries, $1.15 to $1.25. This association is making a success in packing and selling the fruit of its members. Before the organization of the association the majority of the peach growers were discouraged. Peaches of the choicest were shipped and consigned with little satisfaction and no profit. Now their peaches are sold at a profit through the association. Before the association each grower was a competitor in the market. Now they are a unit through co-operation.

A. H. CARSON,
Commissioner Third District.

SEMIANNUAL REPORT, OCTOBER, 1902.

GRANTS PASS, Oregon, October —, 1902.

To the Honorable State Board of Horticulture—

GENTLEMEN: I respectfully submit to you my semiannual report as commissioner of the third horticultural district, embracing the counties of Douglas, Coos, Curry, Josephine, Jackson, Lake, and Klamath.

I have received and answered during the past two years about four hundred letters from all parts of my district on subjects pertaining to all phases of horticulture, including insect pests, fungus diseases, methods of cultivation, planting new orchards, pruning, spraying, adaptability of soils to fruit culture, etc. I find nearly all classes who are growing orchards, the man who grows but an acre or two to the large commercial growers, all seeking information on horticultural lines to improve the conditions of the industry. That the fruit growers are adopting modern methods in their business and rapidly improving on practical lines can not be questioned. Their orchards show this when you compare them now with two and three years ago. Methods of spraying have improved, and confidence in spraying for insest pests and fungus diseases has been established in the minds of a majority of the fruit growers.

Two years ago Olwell Bros. of Central Point did the spraying of their 160-acre orchard with gasoline power, and their success in doing the work rapidly and thorough at fifty per cent less cost than it could be done with hand power was an object lesson that many fruit men in this district are now profiting by. In Jackson County at the present time there are twenty-five gasoline engines used for running spray pumps. The gasoline engines in use are one and a half horse power, called "The Jack of all Trades," and spraying outfit, including pump, hose, tank, with everything ready to go to work, costs about $200, excepting wagon and team. From a business standpoint Olwell Bros., after using gasoline power three years, are well pleased, as they say their spraying costs them fifty per cent less now than when they used hand power, and they say spraying done by uniform engine power is much more effective than when done by irregular, weak hand power. They claim were gasoline and hand power equal in cost, the saving in effective, thorough work in their orchard would soon pay for a gasoline outfit.

When four-tier Yellow Newtowns sell for $2.25 per box, as they did last winter in the London market, it can be readily seen that effective spraying is a material factor in the profits of the apple grower.

Olwell Bros., W. H. Norcross of Central Point, Weeks & Orr, J. H. Stewart, J. A. Whitman, G. Voorhees of Medford, all of Jackson County, by thorough spraying with gasoline power at apple gathering time find that from ninety per cent to ninety-eight per cent of their apples are sound, free of worms, and not infested with scale.

During the past two years I have personally visited and inspected about 350 orchards in my district, varying in size from one acre to one hundred and sixty, averaging about fifteen acres to the orchard ; also have visited the fruit packing plants, inspected the same, and have enforced the law as far as possible as to the shipping of infested fruit. I have in enforcing the law in a number of cases among local fruit dealers found scale infested fruit being offered for sale. In all such cases I have condemned the fruit and caused it to be destroyed by burning. 'I have distributed through the mail 350 copies of the sixth biennial report of the State Board of Horticulture, also a large number of spray bulletins, both No. 1 and No. 2. I found the number of biennial reports—350—allotted me for distribution inadequate to the demands of the growers of my district ; have had many applications I could not fill.

Of the orchards I have visited I found the owners alive to the necessity of cultivation and proper spraying, seeking to know the best methods of destroying injurious insect pests and fungus diseases. A great many of the progressive growers have been successful while others have sprayed and failed in results. Many of the failures I found on investigation in case of scale as well as codling moth to be the fault of the sprayer in using the wrong compound prescribed by the state board. In making the compound many growers were careless in its preparation, while a good many ignored the remedies of the board and used remedies sold by some traveling fake agent that were guaranteed to cure any disease or kill any insect an orchard might be affected with. As a matter of course total failure always followed in the use of the fake agent's remedies. In some instances failure occurred when the proper remedies were used. In all of these cases of failure I found obsolete spraying outfits in use which would make it impossible to apply the compound effectively.

Late winter and early spring of this year, weather conditions were unfavorable for spraying. Many heavy rains in February and March put the land in condition that made it difficult for the sprayer to get into his orchard, hence spraying that should have been done earlier in the season to be effective was done later when the buds on the trees had quickened, which, to an extent, caused a partial injury to the fruit buds in some cases. Spraying with salt, sulphur, and lime compound for scale must be done while the tree is dormant, otherwise if deferred too late in the season after the buds begin to grow, while the scale may be destroyed, it will result in more or less injury to the fruit buds.

Among the fungus diseases that has given the apple growers in Josephine and Douglas counties much trouble and loss of trees is the apple anthracnose, or, as it is locally known, canker, or dead spot. Many growers have sprayed for this disease with bordeaux, used the knife in cutting out the affected tissue with poor success, until many intelligent apple growers have become discouraged, and, in some cases, have taken up their apple trees.

I confess that for some time I felt that it was a disease we did not understand, and that it could not be successfully treated with the spraying compounds thus far tried; cutting out the fungus did not prevent the fungus from breaking out and growing on healthy tissue the next season. In studying the disease and noting the observations of growers through the district I have found that it is a winter disease in this climate. That is, the fungus does not begin to grow or attack new tissue until in the fall, then it grows during the winter months, matures its spores in the spring, which remain dormant until the following fall. After understanding the habits of the disease, its period of growth, and knowing that period is during the winter months, we find the cause of failure in spraying with bordeaux is because it was not done at the proper time.

It must be remembered we can not control or destroy fungus growth after it begins to grow with bordeaux. We prevent its growth by removing the cause—the spore, which is nothing more or less than the seed of the fungus. Destroy the germinating qualities of the spore and we have removed the cause. A solution of bluestone or sulphate of copper, which is the component part of bordeaux mixture, destroys the germinating quality of the spore of any fungus it comes in contact with. Then, to treat any fungus disease with success, we must spray

for it with bordeaux after it has thrown off its spores and before they begin to grow.

The apple anthracnose, or canker, matures and throws off its spores during the spring and early summer months. These spores lodge in favorable places on live tissue and remain dormant until cool, damp weather in the fall or winter when they begin to grow, destroying with their growth healthy, sound tissue wherever they may have lodged. Cutting out with a knife is of but little benefit and not practical, if it was a specific, owing to the expense. Hence, the only practical remedy is to spray the whole tree with bordeaux, and this spraying, to be effective, must be done as early in the fall as possible, or just as soon as the apples are gathered. It is not material whether the foliage is on the trees or not; when the apples are gathered spray with bordeaux of double strength. What old leaves that are destroyed at that season of the year by the spray will do no damage.

Eisman Bros., who have an apple orchard of 20 acres six miles west of Grants Pass, found it badly diseased with anthracnose. In fact, the fungus would in a short time have destroyed the orchard had not the brothers taken hold of the matter determinedly. They bought a gasoline engine and pump and began systematic spraying with bordeaux as early in the fall as the apples were gathered. Eisman Bros. are intelligent, energetic young men, and determined if it could be done to save their fine orchard from the fungus. That they have been rewarded with success is evidenced by the present health and luxuriant growth of the orchard. The old dead spots are rapidly healing over; no new growth has appeared, and this year the orchard will yield about 8,000 boxes of apples. This fall Eisman Bros. will spray again with bordeaux, as they now know that fall spraying will destroy the disease and keep their orchard healthy and free of the fungus.

William Hellwell of Yoncolla, Douglas County, has a fine 10-acre apple orchard that the anthracnose became well established in. He was very successful in treating the disease by spraying with bordeaux early last fall. Other orchards in that vicinity diseased with the fungus were nearly dead in June of this year when I visited that locality. In unsprayed diseased orchards at that season of the year the foliage of the apple was as brown as it would be in October, without fruit, while in Mr. Hellwell's orchard the foliage was a deep, luxuriant green, with a heavy crop of thrifty apples growing, which will be choice for the market this fall.

CODLING MOTH.

This pest, which is so destructive to the apple, is being successfully handled, and cheaply too, with the modern spraying outfit. All of the commercial apple men of this district by practical experience with the spray pump have demonstrated that they can grow sound apples free of worms by spraying. A few years ago fifty per cent of a crop of sound apples free of worms was regarded as the maximum by most of the growers. Many were discouraged when they came to gather their apples. At the present, with gasoline power, ninety to ninety-eight per cent of sound apples free of worms is the result being had by such growers as Olwell Bros., J. A. Whitman, W. H. Norcross, and many other Jackson County apple growers.

The remedies suggested by the state board—paris green, and arsenite of lime spray—are both used with good results. A few years ago we had among our apple men a number who doubted the virtues of these sprays, or any spray, to destroy the worm, but the success of those who had confidence has furnished an object lesson to the doubters of which they are now profiting. They now are in line for sound apples.

THE PRESENT CONDITION OF THE INDUSTRY.

As compared with two to four years ago the fruit industry of the district has progressed, is in much better shape, with better methods, is now firmly established on sound business principles. In the years 1899–1900 the gross output of various leading fruits in the district was as follows, Jackson Josephine, and Douglas counties being the principal producers :—

Apples	219,000 boxes
Pears	31,000 boxes
Peaches	177,000 boxes of 20 pounds
Prunes	5,557,000 pounds cured
Apples, dried	191,000 pounds cured
Peaches, dried	109,000 pounds

The estimated gross value of the two years noted was $444,950.

For the years 1901–1902, from careful estimates and reliable data, the following is the output :—

Apples	300,000 boxes
Pears	160,000 boxes
Peaches	160,000 boxes
Prunes	8,000,000 pounds cured
Apples, dried	200,000 pounds
Peaches	130,000 pounds

The estimated gross value of the output for 1901-1902 is $643,000. This value is based on what fruit sold for in 1901, and the prices fruit is being sold for at the present. This estimate does not include any of the small fruits, which would approximate about $60,000 for small fruits, making a total for all kinds of fruits $703,000 for the two years.

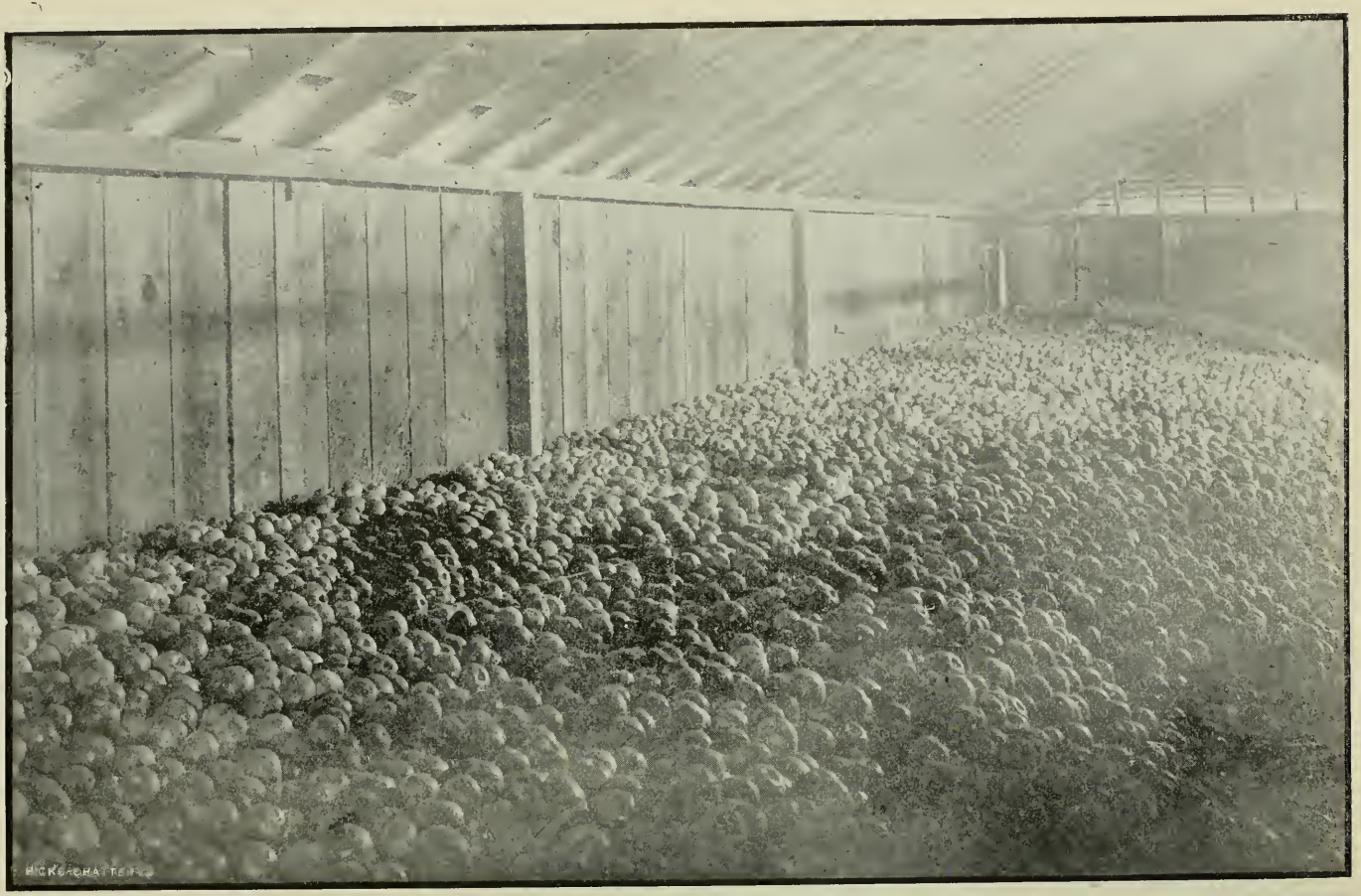
In 1901 the peach crop was a half crop; this year it was a full crop. The apple crop of 1901-1902 was only sixty-five per cent of a crop. In 1901 the prune crop was a full crop, while this year it is but a half crop.

In 1901 the demand for apples was good and prices f. o. b. ruled high. Thus far this year the indications are that apples will be in good demand and possibly last year's prices will be had.

That the fruit growers have confidence in the future of the industry is evidenced by the planting out of new orchards. Last fall and winter in the vicinity of Central Point and Medford, Jackson County, there were planted 1,500 acres in new orchards, the greater per cent being the apple, the Yellow Newtown leading all other varieties in acreage. The Yellow Newtown grows and matures to perfection about Central Point and Medford, and being a long keeper, bears transportation to foreign markets, where it sells for high prices. It has been observed that the Yellow Newtown matures to perfection on the adobe soils in Rogue River Valley, and in time much of that land will be planted to Yellow Newtowns. Jonathan and Early Spitzenburg are two great favorites with commercial apple growers. Their color is superb, with a delicate flavor, that makes them prime sellers about the holidays, their season of ripening in this climate.

That the profits of fruit growing in this district is better than anything else the land could be used for can not be questioned. An established apple orchard of standard varieties on soil congenial to the growth of the apple is a bonanza to the fortunate owner. No doubt greater profits are made by the apple growers than in any other line of fruit growing. The peach growers of Ashland, Merlin, and Roseburg find ready sale for their peaches in markets north at good profits. There

ORCHARD SCENE AT ASHLAND, OREGON—1902.



PACKING HOUSE OF HON. H. B. MILLER, TWO MILES WEST OF GRANT'S PASS, OREGON.
8,000 BOXES OF APPLES READY TO PACK.

are many acres of choice apple land not planted in Jackson and Douglas counties that in a few years will be planted. The apples from the third district are becoming known in foreign markets and readily sell at top prices in competition with the celebrated apples of Watsonville, California.

During the past two years I have served 250 notices of disinfection on owners of orchards infested with San Jose scale, and in all cases I believe the requirements of the notices were complied with.

In a number of cases I have found local dealers offering scale-infested fruit for sale. In all such cases I condemned the fruit and had it destroyed by burning. I find a willing disposition on the part of all local dealers to respect the law, and in all cases where I found infested fruit in the hands of dealers they had no knowledge as to the identification of scale; all were innocent of any intent to violate the law.

The San Jose scale is one of the pests the fruit grower has to contend with, and probably always will have. The remedy salt, sulphur and lime is a specific, and if thoroughly applied with a good spray pump during the winter months, assures the grower smooth, clean fruit the fall following. That the fruit grower will always have the San Jose scale to contend with I base the prediction on the fact that I have found the scale thriving and at home on the willow, wild plum, and thorn. While the scale is active during the summer, moths and birds will carry it from infested localities to the orchards. That birds carry and distribute the pest I am able to verify, as I have shot them in scale-infested orchards and found the live scale in large numbers on feet and feathers. The best protection the grower has against the pest is to spray for it annually, or at least every other winter, and not complain too much of his neighbor, as the neighbor, as well as himself, may have had his orchard infested from willow patch, thorn or plum thicket, growing on the public highway out of either's jurisdiction.

As the fruit growers gain experience in packing, grading, and putting up the products of their orchards in neat, attractive packages, with love and pride in the work, always keeping in mind that there is never an oversupply of the best, that the best is always in demand at good paying prices, he will then have gained the right road to success in his calling. From year to year I find our packers improving in methods of packing and handling fruit. At the beginning of the fruit packing

period of this district help of all kinds had to be taught how to do it. From year to year the packers employ their old help until nearly all help employed have become expert. For neat, rapid apple, peach, or pear packing, the handsome girls of Rogue River Valley and the Umpqua can not be beaten.

I think no finer or artistic pack of apples were ever put on the market than I saw packed last fall by J. A. Whitman, Weeks & Orr, G. Vorhees of Medford, Olwell Bros. and W. H. Norcross of Central Point, T. P. Lee and H. B. Miller of Grants Pass, or of peaches packed by the Ashland Fruit Association, under the management of G. W. Crowson, the superintendent. All of these packers believe the trade demands the best, and in season they are ready to supply the demand.

As a suggestion for the state board's consideration, I believe we should have printed blanks for fruit inspection, officially signed in blank by the president and secretary of the board, with a blank space left for signature of the member of the board who makes the inspection to sign, in case he inspects a car of apples or other fruit for packers in his district. That the member of the board only makes the inspection at the request of the packer and issues the certificate only when he has made a careful inspection and knows the contents of the car is in no manner infected with injurious insect pests. By doing this we would aid the packer who ships his pack to states which have stringent quarantine laws, and we would establish confidence in the minds of the buyer, and in time the certificate of inspection of the board would be respected and honored in all markets Oregon ships her fruit to.

Last winter I was called upon to inspect several cars of apples, which I did. I found them in fine condition and free of injurious insect pests. I issued my certificate as commissioner of the third district, by writing the same on any sheet of paper I could obtain. The packer desires to send these certificates with his shipping bill. A certificate, to carry any weight with it, should be in an official form and attested by the officers of the board to entitle it to any respect out of the state.

A. H. CARSON,
Commissioner Third District.

REPORT OF THE COMMISSIONER.

FOURTH DISTRICT.

FIRST QUARTERLY REPORT, APRIL, 1901.

The Dalles, Oregon, April 3, 1901.

To the President and Members of the State Board of Horticulture—

Gentlemen: I herewith submit my report for the months of January, February, and March.

I have visited different portions of my district, especially those that were affected by the San Jose scale. I have notified those growers, either in writing or verbally, to spray the trees, as this is the proper time of year to spray. I have not had much trouble with the large growers, who raise fruit on a business basis, but the small growers, who have only a few trees, can ill afford to buy spraying apparatus, so I have two gangs of men working and spraying all those small orchards in the vicinity of The Dalles.

I was under the impression, a year or two ago, that the San Jose scale was disappearing from my district, but I have found out that I was mistaken. We have a great deal of the San Jose scale yet; but the fruit growers understand the handling of the scale better, and they can easily get rid of it by spraying at least once every two years. If the codling moth was as easy to get rid of as the scale, we would not have much trouble in raising good fruit.

At the present writing the prospect for a fruit crop is excellent. The peach trees, almonds, apricots, and cherries are in blossom, and they show good signs for a splendid fruit crop.

There have been a great many trees planted in the last three months in my district, principally apples and peaches. The fruit growers are beginning to learn that it pays to plant good fruit. In the apple line, they plant mostly Yellow Newtown, Spitzenburg, and Jonathan, as they are late keepers, and there is more money in them than in any other kind of fruit. There is another apple, very sparingly planted in my district, that I think would be a good apple for some of the fruit growers to plant, and that is the Red-cheeked Pippin. I would not

advise any one to plant many of them ; but they fill the place when the Ben Davis and the Spitzenburg are gone.

It looks to me as if there ought to be a law passed in this state compelling every person, who offers to sell fruit of any kind, to have his name on the boxes, and the locality where the fruit was raised ; also the name of the fruit, and if apples, to state the size on the box, whether it is a four, five, or six-tier apple. That would protect the honest fruit growers. If the grower or the fruit packer is ashamed to put his name on his fruit, he ought to get out of the business. When you see a nice box of apples on the market at a fruit stand anywhere, you will invariably find the packer's, or, at least, the fruit grower's name on it ; but when you find an inferior lot of fruit you will never see any name on it.

How often the good housewife goes to market and buys a box of apples and finds nice four-tier apples on the top of the box, and in the bottom finds nothing but six-tier apples, or even a lot of poor rotten stuff. There ought to be some punishment attached to dealings of that kind, and I leave it for the board to take up.

EMILE SHANNO,
Commissioner Fourth District.

SECOND QUARTERLY REPORT, JULY, 1901.

THE DALLES, Oregon, July 5, 1901.

To the President and Members of the State Board of Horticulture—

GENTLEMEN : The following is a report of my work for the months of April, May, and June :

I have visited different parts of my district and I find that there will be a good average fruit crop ; some of the trees are overloaded, rendering it necessary to remove part of the fruit. The prospect for a good price for fruit this fall is better than I have ever seen here. There are buyers now in my district offering to contract for apples, such varieties as the Spitzenburg and the Yellow Newtown, at $1.25 per box, and are willing as soon as contracts are signed, to make advances on that basis, but there are very few people willing to make contracts at this figure.

There has been a good deal of spraying done this spring and summer for the codling moth, but I find that some of the growers have not used enough lime and have made their arsenic spray too strong, and thereby burned the leaves ; this is a

mistake that some of them make; most of them I find do not use enough lime, and those that use a sufficient amount of lime have generally the best results.

I have found some young orchards which were planted this last fall and spring that it would have paid better if they had not been planted at all; there was a great scarcity of fruit trees this last season, and the result has been that they have planted almost anything in the way of trees. I have found trees that were not much larger in diameter than a pipe stem and not over from ten to twelve inches high, and these trees ought not to have been planted because they will never amount to anything. I would not advise any one to plant trees that are less than five feet in height and at least one year old and they should all be of a uniform height.

There is another matter that I have learned by observation in the last few years and that is that there is more harm done through the use of the knife and saw than any other thing, and especially is this true in the young orchards in my district. I have found some trees that are as much as seven or eight years old that never had an apple on, and I know some young orchards that were last year from four to five years old that had as much as five to eight boxes of apples each.

Any one who is intending to plant a young orchard ought not to trim the trees. After the second year from the planting the tree ought to be shaped during the first and second year, and ought not to be molested, except to have the water sprouts taken out, and that should be done through the summer time with a pocketknife.

These suggestions have reference only to apple and pear trees. Cherry, peach, plum, and prune trees require altogether a different treatment in this respect, as there is no danger of trimming a peach or prune tree too much, and most people do not trim them enough.

EMILE SCHANNO,
Commissioner Fourth District.

SEMIANNUAL REPORT, OCTOBER, 1902.

THE DALLES, Oregon, October —, 1902.

To the Honorable State Board of Horticulture—

GENTLEMEN: I have the honor to herewith submit to you my first biennial report as commissioner of the fourth district for the State Board of Horticulture. This district covers a

very large area, comprising the counties of Wasco, Sherman, Gilliam, Morrow, Wheeler, and Crook. My appointment dates from June 12, 1902, having been appointed to fill the unexpired term of Mr. Emile Schanno, deceased.

Owing to my short incumbency of the office, this report must necessarily be brief, and it will lack that completeness in detail which only observation and investigation can impart.

I have so far confined my labors entirely to those sections of the district containing the largest orchards, and to the inspection of nurseries.

While I have been familiar for quite a number of years with orcharding in the district, it may be said that my general knowledge is of a superficial nature only, and lacks that close scrutiny which the laws demand of the members of the State Board of Horticulture.

So far as my observations extend, I am most favorably impressed with existing conditions and the high state of perfection of most of the orchards I have visited. Of course I have scarcely visited anything but orchards of commercial size, up to date, and my next report may be less flattering, for by that time I hope to have been able to visit most of the fruit growing sections of the district. While I have inspected quite a number of orchards, I have found no signs of that much dreaded insect, the San Jose scale, in any of them, and I believe that it has practically disappeared from our commercial orchards.

This is further indicated by the entire absence of the insect on the fruit offered for sale on the stands of the commission men, when a few years ago it was not an infrequent occurrence to find infested fruit offered for sale. There are now, no doubt, some small orchards throughout the country, where scale may be found in great abundance, as also on the fruit trees in our city and town lawns, where spraying is not practiced at all or only in an unmethodical and desultory fashion; but even these cases are not alarming, and even here it is being stamped out. I shall give my particular attention to the cleansing of these small orchards when the proper time for spraying arrives. The fact that we have successfully combated, and practically eradicated the scale, should not make us slack in our vigilance, however, and I would advise that every orchard in the district be sprayed with the sulphur, salt and lime solution at least once each year, and thus frustrate its every effort to ever again become established in our orchards.

Curl leaf on the peach trees last spring caused considerable annoyance and loss to the fruit growers of this section, only the very hardiest varieties having anything like a full crop. A thorough application of bordeaux mixture, before the buds open, will be found to prevent this disease. For several years I have added three pounds of blue vitriol to every fifty gallons of the sulphur, salt and lime solution when spraying for the scale, with very beneficent results. This spring, having omitted it, my peach trees were considerably infested with this fungus. This mode will also be found much cheaper than to make two separate sprayings, one for scale and the other for curl leaf.

The codling moth I find is the arch enemy of the apple grower, and does more damage than any other insect or pest in the vocabulary of the spray calendar, unless vigorous means are employed to keep it in check. Nor does this intrepid insect confine its ravages to the apple alone, but shows a decided inclination for pear meat. Serious though the ravages of this insect are when allowed full and undisturbed sway in an orchard, the spray pump here too is the victor when loaded with the arsenite of soda solution and in the hands of a resolute orchardist. It is gratifying to note that where the directions given in the Spray Calendar, issued by the State Board of Horticulture, are carefully followed, the codling moth becomes conspicuous by its absence. That it pays to spray systematically, intelligently, and persistently, can be answered most effectively by those who have been spraying their orchards for a year or more.

While spraying is necessary to the successful production of fruit, it should be remembered that cultivation and thinning are quite as essential. Neglect in cultivation is a great factor in preventing the development of both tree and fruit. Especially is this true of our dry hill ground, where nothing that can be done adds so much to the growth as thorough cultivation. Here where we can not irrigate, and where the rainfall amounts to very little in the summer, we must rely entirely on the cultivator to retain moisture, and to accomplish this it is necessary that the ground should be stirred regularly at intervals of ten days to two weeks. Too much stress can not be brought to bear on this subject of cultivation.

The practice of thinning is regarded by some as a material loss, whereas the opposite is the case, for by removing part of the fruit, the nourishment that they would have consumed is

utilized by the remaining fruit, thus resulting in the production of a much superior article of fruit.

The formation of fruit growers' unions should be encouraged in every fruit-growing community, in order that the fruit may be sold direct. The advantage to the grower in selling direct is manifest; it saves middlemen's profit, and he receives more near the full worth of his fruit.

Cherries, peaches, and prunes were a light crop this year, running from 50 to 75 per cent, owing to hardiness of variety. Alexander and Hale's Early made nearly a full crop, while the Crawfords, both early and late, were nearly a total failure. Apples and pears, I think, will averrge 95 to 100 per cent throughout the district. Hood River Valley, long noted for its strawberries and apples, this year has exceeded all expectations, having produced of strawberries 57,000 crates or 95 car loads, which were nearly all sold f. o. b. cars at Hood River, and brought to the valley the enormous sum of $125,000. The apple crop here will amount to 120,000 boxes, which with pears, prunes, cherries, and other small fruit will bring another $125,000, making a grand total of $250,000 brought into the valley for fruit this season. Nor has the limit been reached yet, and I am satisfied that within five years this amount will be doubled, as numerous young orchards containing thousands of trees will come into bearing in that time. Neither has strawberry growing reached its limit, for many new plantations are going out, and the acreage is increased annually.

Another part of the district that will be heard from with its "Big Red Apples" is Mosier. Here the orchards are for the most part young, some just coming into bearing. The extent of the fruit crop here is about as follows: Apples, 10,000 boxes; prunes, mostly Italian, 200 tons; plums, 25 tons; besides this there are some cherries and pears, but these are very limited.

At The Dalles we find the fruit growing more diversified. The soil here seems particularly adapted to prunes, peaches, cherries, and grapes. There are also a great many apples and pears grown here. The tendency here now is toward cherries and peaches, on the lower plateaus where these varieties attain perfection. Apricots and nectarines are also being planted quite largely the last few years. Nut culture should receive some attention from our planters, as it has been fully demonstrated that soft-shell almonds and English

VIEW IN ORCHARD OF CHRIS. M. STACKLAND, COVE, OREGON—1902.

ORCHARD AND GARDEN OF H. J. GEER, COVE, OREGON—1902.

walnuts can be grown to perfection. Beautiful specimens of these varieties were exhibited at The Dalles Fruit Fair last year and again this season. Here the crop this year will be about as follows: Apples, 35,000 boxes; crab apples, 500 boxes; pears, 8,000 boxes; peaches, 25,000 boxes; cherries, 35 tons; prunes, 400 tons; plums, 100 tons. Besides this, a great many apricots, quinces, nectarines, grapes, and small fruits are grown here.

The following figures show amount of fruit produced in the district as near as I have been able to ascertain :—

Apples	250,000 boxes
Crab apples	1,500 boxes
Pears	25,000 boxes
Peaches	65,000 boxes
Apricots	3,000 boxes
Nectarines	500 boxes
Cherries	65 tons
Prunes	750 tons
Plums	200 tons
Strawberries	65,000 crates
Raspberries	3,500 crates
Blackberries	5,000 crates
Grapes	50 tons
Currants	3 tons
Gooseberries	5 tons

At the ruling prices this would bring something over $450,000 to our fruit growers of the fourth district this year.

R. H. WEBER,
Commissioner Fourth District.

REPORT OF THE COMMISSIONER.

FIFTH DISTRICT.

QUARTERLY REPORT, OCTOBER, 1902.

Cove, Oregon, October 9, 1902.

To the President and Members of the State Board of Horticulture—

Gentlemen: I submit herewith my quarterly report. In the company of President Smith, in the month of July, I made a tour of inspection into Grant County. The country is an exceedingly difficult one to cover, and ours was the first visit it had ever received from members of the horticultural

board. The territory is immense when compared to the number of orchards visited. It is truly a country of magnificent distances. While at John Day we undertook to map out our course, and began to inquire about the various places of which I had often heard, and to which I was now ready to give my individual attention, and the nearest was 90 miles away and the other from that to 125 miles. It is needless to say that I did not "take a walk," as the thermometer was registering around the 100 mark.

Nevertheless we visited as many orchards as we conveniently could, and found them, as is usually the case in isolated orchards, in very healthy state, free from any insects or pests of any consequence. Their market is, of course, entirely local, and confined to adjoining mining camps, etc.

Everywhere we called we were most cordially welcomed and hospitably received and found the kindliest feeling existing and a readiness to receive such help as is given by our report bulletins. If the country ever gets a railroad there is much of it that could profitably be devoted to fruit growing; as it is, it is a grand stock country, and the people as a rule seemed independent and happy.

It is too early in the season yet to tell how much fruit will be shipped from the fifth district, except strawberries and cherries, which was about 18 cars of the former and 12 of the latter.

Apple picking has just started and in a few weeks I can estimate the number of cars very closely, while any estimate now is a guess. Over a good share of the district the apple crop is good.

The prune crop is light, and the prune trees are affected with curl leaf more than any year since 1899.

JUDD GEER,
Commissioner Fifth District.

FINAL REPORT, NOVEMBER, 1902.

COVE, Oregon, November 5, 1902.

To the President and Members of the State Board of Horticulture:

GENTLEMEN: Herewith I present you my second quarterly report. It covers as nearly as possible the biennial term ending January, 1903.

While I regret that more has not been accomplished, I have

endeavored to do my best with the means at my disposal, and I feel it is my duty as a public officer to account to you for the time and money expended in my district in the interest of horticulture.

The fifth district includes the counties of Umatilla, Union, Baker, Wallowa, Malheur, Grant, and Harney, all of which I have visited with the exception of Harney County. I have traveled between 4,500 and 5,000 miles in performance of the duties of my office, have visited more than 450 orchards, have distributed about 150 reports, and given spray bulletins freely wherever I have felt there was any chance of their doing good or falling into the hands of any one who would make use of them. Everywhere the reports and bulletins have been most kindly received and eagerly sought for by many, if I may judge by the letters which have been received requesting them. I have received about 200 letters, to all of which I have given my personal attention.

On account of the size of my district I am not able to obtain statistics with the same accuracy and promptness as one who has a small and more accessible territory. There are about 3,700 acres of commercial orchards, which, of course, does not include the trees surrounding nearly every dwelling house in many parts of my district. I have made a careful estimate and believe I have been fair and just. Fully three fourths of the fruit grown for profit in my district is apples. The crop is unusually good in quality and quantity. Approximately, I would place the crop of apples at 250,000 boxes at 60 cents per box, $150,000; fresh prunes, 20,000 boxes at 40 cents per box, $10,000; dried prunes, $10,000; pears, 15,000 boxes at 50 cents per box, $7,500; peaches, 30,000 boxes at 25 cents per box, $7,500; strawberries, 18,000 crates at $1.50 per crate, $27,000; cherries, 24,000 cases at 75 cents per case, $18,000; grapes, blackberries, raspberries, etc., $20,000. Making the total of $250,000.

I have confined myself to the commercial standpoint of the fruit question. If we count the fruit used for home consumption, that used for canning, drying, and preserving, that made into cider and vinegar, and the refuse fed to hogs and stock another $50,000 might be added, making a total valuation of $300,000.

There is a wonderful activity in some parts of my district in the sale and development of fruit lands, notably in Grande Ronde and the irrigated portions of Malheur County. In the

vicinity of La Grande are two very pretty fruit tracts, May Park and Fruitdale. Several commercial orchards have changed hands during the past year at prices ranging from $300 to $500 per acre. As a rule, they are progressive growers, anxious for the best methods, and while they have had some trials, and the codling moth has gained a foothold, in the main they have done well. The much-dreaded San Jose scale has never made its appearance there or elsewhere in Grande Ronde Valley to my knowledge, although I have found some bad cases of oyster-shell scale in some old orchards.

I have come to the conclusion that the question of dealing with the codling moth and its ravages is almost entirely one of education among the growers. In some parts of my district where they have been obliged to spray thoroughly to rid themselves of the San Jose scale in order to save their young orchards, the result has been so satisfactory that they are convinced of the efficiency of the spraying and are doing most excellent work in their commercial orchards in keeping down the ravages of the codling moth.

At Cove some large farms are being divided and sold in small tracts for fruit growing. It is a remarkable fact that nearly all of the orchards on the foothills at this place are free of the moth, while some few have had it for years. It does not appear to increase or spread materially.

The future commercial orchard of Grande Ronde will be mostly apple; cherries mature to perfection, but come too late to bring high prices in the Eastern markets. It would be an ideal place to grow cherries for canning purposes, for the quality is beyond question. There are some large prune orchards, but I know of no new ones being planted. Pears have not proved profitable, and peaches are too tender for this climate. There are three evaporaters in the valley, at Union, Summerville, and High Valley.

Eagle Valley is a little paradise for fruit growers. Water, air, and earth seem to unite in a perfect combination. The valley is small. They have an abundance of water. The soil is of a porous nature, so well adapted to irrigation, and the hills about it seem to gather the sun's rays and reflect them in such a way as to ripen and color their fruit to perfection and to protect them from all frosts and cold winds. It seems to be a paradise for the San Jose scale as well by the way in which they thrive. I have more complaint of it in this little valley than all the rest of my district.

I visited Umatilla County a few weeks ago and was glad to learn that the scale is fast diminishing and that there is a strong growing sentiment to fight the codling moth. I understand that much more spraying for it was done this year and that they feel well paid by the good results. To me one of the most interesting portions of my district is the irrigated land of Malheur County. The orchards are under a fine system of cultivation and the results are truly wonderful. Nothing would do so much to place Eastern Oregon on a footing with the more highly developed portions of our country as the development of her arid lands.

There is no branch of agriculture in which a mistake in the beginning is so serious as that of fruit growing. The commercial fruit grower can not afford to experiment. An experiment costs him too much. He should leave that to the man who can afford experiments. Let the wrong varieties be selected, or his trees be planted too closely together, and there they stand a living reminder to him for years, perhaps a lifetime, of his folly. A little mistake in the beginning and his income may be reduced by half, not for one year, but a lifetime. Too much attention can not be given to varieties, and other things being equal, I would always select a variety with an established reputation. An old and favorite variety will often bring from twenty-five cents to fifty cents more per package, and of course this amount is clear profit. The "new variety fiend" and the nurseries that are always booming something "new" have damaged the commercial fruit growers thousands of dollars in my district.

In October I made the yearly examination of the nurseries in my district. I found them in good shape. So far as my experience has gone I found the nurserymen willing at all times to co-operate with the board. The cool, dry atmosphere of Eastern Oregon produces a superior grade of stock. It is much easier to keep it clean and free from injurious insects in such a climate. I do not favor the irrigation of young trees to any extent. Cultivation without irrigation, if possible, produces the best stock. I have seen beautiful year old trees grown with plenty of water; their bark was glossy as though it had been varnished, and they stood from six feet to ten feet in height. I never saw anything more attractive in the way of young fruit trees, but they would not be my choice if I were selecting stock for my planting. The top had outgrown the roots, as it were, and the tree would not prove half so hardy

and vigorous for transplanting as a tree three feet or four feet high with the wood more thoroughly ripened.

My choice of trees for setting a commercial orchard would be always for year old stock. I would keep it thoroughly cultivated. Do not try to make the land pay too big. In the long run we gain if we tax our land but little during the period of waiting for the bearing age of a young orchard. While I have advocated the cultivation of young orchards *thoroughly*, I would not be understood to mean that they should be cultivated late in the season. Such a course would leave the wood tender at the beginning of winter, and if severe freezing occurs during the winter they are liable to be killed. An orchard disc and Planet Junior cultivator puts the ground in the best possible condition. Cultivating the ground twice a month will keep it in good shape. After the first of September I would discontinue the cultivator, as this tends to check the flow of sap and the new wood will ripen and harden more perfectly.

If Oregon will give her best efforts to the grand staple of all fruits, the apple, choose the choicest varieties, keep them clean and healthy and free from the loathsome codling moth, she will make for herself a reputation which California, with her orange groves, will envy.

JUDD GEER,
Commissioner Fifth District.

REPORT OF THE SECRETARY.

To the President and Members of the State Board of Horticulture—

GENTLEMEN: Herewith I submit to you my first biennial report. On the resignation of Mr. Henry E. Dosch as secretary of this board in March, 1901, to accept the position of general superintendent of Oregon's exhibits at the Pan-American Exposition, to be held at Buffalo, N. Y., I was elected as his successor.

WORKINGS OF THE OFFICE.

A very large portion of the time of the secretary is taken up with correspondence. It comes from all quarters of the

globe, and upon all subjects pertaining to horticulture. A rapidly growing demand on this office is the constant stream of inquiries from intending homeseekers, who desire information on the possibilities for fruit growing in Oregon. To all such I have given prompt answer, with full and painstaking detail.

Another branch of work that comes to this office is the looking after nursery shipments that come to us from other states.

The transportation companies notify this office of all shipments of nursery stock arriving at Portland. It then becomes our duty to notify the commissioner in whose district the point of destination is located, and its probable time of arrival, when the commissioner can be prepared to make inspection without loss of time, or the holding up of a shipment to its injury. I have inspected all nursery stock having Portland as its destination. These shipments consisted largely of seedling stock from France and several shipments of florists' stock from California and Japan. There being no provision for the employment of a fruit inspector for Portland, I have put in as much of my time on this branch of the work as could be spared from other duties.

During the fruit season I have visited some part of the markets in the city each day. The law pertaining to the selling of any infested or diseased fruit of any kind in the state was mailed to every fruit dealer in the city. In my visits to and talks with dealers, they have not only expressed a willingness to comply with the law, but have gone one better, and expressed in strong terms the necessity and their desire of shutting out all infested or diseased fruits. During the season of 1901, it was the rule to find wormy apples with almost every dealer, and occasionally fruit infested with San Jose scale was to be found. I found by giving a little time and patience in acquainting the dealer with the disgusting appearance of the scale—by means of a magnifying glass—there was no trouble in getting the dealer to destroy the infested fruit, and he was put on his guard as to future purchase. I am glad to be able to bear witness that so far this season there has been less wormy fruit placed upon this market than in years past, and, as for San Jose scale, it is becoming almost unknown.

There is no doubt but what growers are taking more pains with their orchards than formerly, both in cultivation and in

the matter of eradicating them from insect pests. Then again, it is becoming a harder proposition in these prosperous times, to dispose of an insect infested lot of fruit at any price.

THE BOARD'S LITERATURE.

There is a constant demand for the literature issued by the board, not only by our own people, but it reaches out to every state in the Union, Canada, England, Germany, Australia, and Japan. As a standing advertisement of the fruit industry in Oregon, its equal has never been produced. Very many complimentary notices have been received from far and wide, on the matter making up the sixth biennial report issued by the board. Mr. Henry E. Dosch, the compiler of this work, should feel highly complimented, when it is known that it is used at Cornell and the University of Minnesota as a text-book in classes in forestry and horticulture. It is with pardonable pride when I state that the fifth and sixth biennial reports received the highest award at the Pan-American Exposition held at Buffalo, in 1901—a gold medal—in competition with reports from many other states.

Spray Bulletin No. 2, compiled by President Smith and issued in July last, has been thoroughly distributed over the state, and has received very favorable comment.

MEETINGS OF THE BOARD.

The semiannual meetings of the board are held in April and October. At these gatherings, papers are read by each commissioner on subjects most vital to the horticultural industry, and discussion of new experiments in the war against fungi and insect pests, reports of which are published in part in the daily press, and more fully incorporated in this work. Very interesting horticultural meetings have been attended by members of the board at Newberg and Corvallis; papers on subjects of interest to the fruit grower were read and discussed.

At Salem, Milton, La Grande and Cove, President Smith has assisted in organizing co-operative fruit unions.

ORCHARD PLANTING.

There must be a very large increase in the area that is being devoted to fruit growing in our state, judging from the large amount of nursery stock that began to arrive early in

PAN-AMERICAN EXPOSITION

BUFFALO · NEW YORK · A·D·1901

The Directors, on the recommendation of the Superior Jury, confer their award of

A GOLD MEDAL

on *State of Oregon*

for *Collection of Tomatoes and Dry Tomatoes, Fruits, Berries and Nuts, Fresh, Evaporated and Preserved.*

John G. Milburn President

Edwin Fleming Secretary

Wm. I. Buchanan Director General

Henry S. Pritchett Superintendent of Awards.

the fall and continued until late spring. This applies to shipments from without the state, no account of shipments from nurseries from within the state being kept, but we know it to be very large however. It was of almost daily occurrence for this office to be notified of shipments in transit to all parts of the state.

Shipments for this season have begun to arrive, and up to this time—November 10, 1902,—some half dozen states east of the Mississippi have contributed very largely.

FAME OF OREGON FRUIT.

The excellence of our fruits which were on exhibition at Chicago, Omaha, and Buffalo fairs, have added very much to our fame as a fruit-growing state. It is no unusual thing at this day to have people come into our office and say that the principal thing that attracted them at these fairs was our fruit exhibit at Chicago and Omaha, and that they had pledged themselves that if ever opportunity offered, Oregon would become their home. This leaven has been working for years, and we come in touch with its good results every day. The buyer of fancy apples for Eastern or European markets comes to Oregon for his stock. It is now no uncommon thing to see dealers from the Atlantic States, England, and France in our markets, and the cream of our fruit crops go to those sections each year. Large sales of Oregon prunes have been made this year to French buyers, who have shipped direct to their country. This is an unusual feature of the prune market, France usually being a competitor in the markets of the world. This has been caused by the almost complete failure of her prune crop, causing a deficiency of nearly fifty million pounds, and the Pacific Coast will be called upon to largely make up this shortage.

FRUIT REPORTS.

Following my predecessor in the matter of securing fruit reports, in June and August of 1901 and 1902, I addressed letters of inquiry to prominent growers over the state, and the commissioners worked along similar lines in their districts, and in so far as it was possible, reliable information on the condition and prospects of the crop was gathered and published in the daily press, and agricultural and horticultural papers in the East.

This work was very much to our advantage last year, with the short crop on the Atlantic and middle West. Soon after the June report had been published in the East of the favorable outlook for the Oregon fruit crop, buyers came to our office for more detailed information, and they told me that it was the favorable report that had brought them to Oregon.

PERMANENT EXHIBIT.

It is doubtful if our people appreciate the great benefit the state derives by the object lesson and standing advertisement of the products of the garden, orchard, field, forest, and stream on exhibition at the room of the board, 246 Washington Street, which was inaugurated by Mr. Dosch, maintained by subscription by the citizens of Portland, and helped out to a large extent by the individual members of this board. To show how earnest the board have been in the matter, the following resolution, which was unanimously passed by the board, explains the strong interest taken in the work. It is well to state that the board did not stop with the passing of the resolution, but have contributed liberally; as evidence, we have as fine specimens of fruit on exhibition in our room as can be found anywhere in the world.

At the semiannual meeting held in October, 1901, the following resolution was adopted:

Resolved, That we, the members of the State Board of Horticulture, deem it to the interest of the fruit growers of the state, that a permanent exhibit of all fruits grown in the state be kept on exhibition at the room of the board; and that each member of the board will work earnestly in their respective districts to secure a creditable exhibit, in order to give visitors to the room a reasonable idea of the horticultural possibilities of Oregon.

The room is visited constantly by newcomers, whether they be homeseekers or tourists, seeking information on and studying our resources. On the register can be seen such complimentary remarks as these—"grand," "never saw its equal," "marvelous," "excellent," "first class," and so on without end.

From several hundred letters of inquiry sent out through the state in June, 1901, the following estimates were made of the season's fruit crop:—

PERCENTAGE OF A FULL CROP.

	Apples.	*Pears.*	*Peaches.*	*French prunes.*	*Italian prunes.*	*Cherries.*	*Grapes.*	*Straw-berries.*	*Apricots.*
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Roseburg	75	50	25	100	100	15		90	
Ashland	100	90	75		100		100		50
Grants Pass	80	70	65		100			80	75
Medford	90	60	50	90	100	80	80		
Central Point	95	65	70	100	90	65	90		
Oakland	25	25		10	75	50	100		
Riddles	80	70	40		100		100		
Eugene	40	50	70	100	100	60			
Albany	50				100	100			
Salem	70	50	35		97	60		90	
Dallas	75	40	25		100	85	100	95	
North Yamhill	100	90		95	80			90	
Dilley	75	40	25	90	100	80	100	100	
Forest Grove	80	50	25	100	100	90	100	90	
Woodburn	75	50		100	100	80		95	
Oregon City	70	40	20	90	100	65		100	
Mt. Tabor	60	50	25	80	80	60		100	
Hood River	75	50	35	100	100	50		100	
The Dalles	75	90	70	100	80	50	50		75
Grant	50		75		75		75		
Milton	50	100	100	50	50	75	100	75	75
Tygh Valley	75	75	50	75	100	50	75		
Olex	75	75	25	50	75	75	100		
Condon	75	75	50		50	50			
Kingsley	100			100	100	100			
La Grande	75	75	75		75				
Eagle Valley	60	80	65	75	75	60		50	
Cove	65	75	70		75	60		60	
Scappoose	85	60		25	25	100		90	

FRUIT REPORT FOR THE UNITED STATES FOR JUNE, 1901.

Estimated percentage of a full crop.

	Apples.	*Pears.*	*Prunes.*	*Plums.*	*Peaches.*	*Cherries.*	*Grapes.*
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Arkansas	75				100		
California	90		50		75		
Connecticut	55	40		85	100	50	
Delaware	75	75			80		
Florida		75			80		
Georgia	25		25	80	80		90
Idaho	50	65	50			60	
Indiana	79	45	95	90	100	75	
Illinois	70	60		90	90	80	
Iowa	50	50		65	90	80	85
Kansas	60	65		85	70	75	80
Kentucky	75				90		
Montana	55	100		100			
Missouri	55	50		75	95		85
Minnesota	35			80		75	95
Maine	85			95			
Maryland	50	70			75		
Michigan	50	45		60	75	60	
Massachusetts	25	75		90	100		
New York	12	25					
New Jersey	33	45		80	100	50	
New Hampshire	65	90				85	
Nebraska	50				70		
Ohio	65	75		90			
Oregon	90	75	95		75	60	50
Oklahoma	90			90	75		
Pennsylvania	90	60	95	90	95		
Rhode Island	20	15				20	25
Texas	80	70		40	75		75
Vermont	20	50		60			
Virginia	65	50		50	100	100	
Washington	75	50	95				
West Virginia	80				95		
Wisconsin	40	40		90		90	

The following estimate of the Oregon fruit crop for the season of 1901, was compiled from reports furnished by members of the State Board of Horticulture, October, 1901 :—

Apples, 850,000 boxes	$750,000 00
Apples, evaporated, 150,000 pounds	90,000 00
Prunes, evaporated, 22,000,000 pounds	770,000 00
Prunes, shipped fresh, 100 cars	50,000 00
Pears, 100,000 boxes	50,000 00
Pears, evaporated	10,000 00
Peaches, 240,000 boxes	100,000 00
Peaches, evaporated	15,000 00
Cherries, 5,000,000 pounds	180,000 00
Strawberries, 175,000 crates	210,000 00
Grapes, blackberries, raspberries	150,000 00
	$2,375,000 00

Estimates for the Oregon, 1902, fruit crop were made by the commissioners in their respective districts in June, and again in August, and are as follows :—

FOR THE FIRST DISTRICT.

Apples	100 per cent
Pears	20 per cent
Prunes	60 per cent
Cherries	30 per cent
Small fruits	90 per cent

FOR THE SECOND DISTRICT.

Apples	90 per cent
Cherries	50 per cent
Pears	50 per cent
French prunes	80 per cent
Italian prunes	60 per cent
Strawberries	80 per cent

FOR THE THIRD DISTRICT.

Apples	65 per cent
Cherries	70 per cent
Pears	25 per cent
Peaches	90 per cent
Prunes	70 per cent
Almonds	90 per cent
Small fruits	100 per cent

FOR THE FOURTH DISTRICT.

Apples	100 per cent
Cherries	75 per cent
Prunes	50 per cent
Strawberries	100 per cent

FOR THE FIFTH DISTRICT.

Apples	100 per cent
Peaches	50 per cent
Cherries	75 per cent
Pears	60 per cent
Prunes	60 per cent
Grapes	60 per cent
Small fruits	100 per cent

The season of 1902 being late all over the United States, it was thought best for reliable information, not to send out inquiries until in August, with the following result herewith submitted :—

FRUIT REPORT FOR THE UNITED STATES FOR AUGUST, 1902.
Estimated percentage of a full crop.

	Apples.	*Pears.*	*Prunes.*	*Plums.*	*Peaches.*	*Grapes.*	*Cherries.*
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent*	*Per cent.*
Arkansas	33	60			100	100	
California	80	60	75		90	90	
Connecticut	90	70		30	75		
Florida		25			80		
Georgia		50					
Idaho	90	100	75				
Indiana	20	20				75	
Illinois	50	25		20	75		
Iowa	55	61		47		35	
Kansas	50	50			50		
Kentucky	20	15			10		
Montana	90						
Missouri	35	60			50		
Minnesota	80						
Maine	60						
Maryland	60				75		
Michigan	50	75		65	85	75	
Massachusetts	60	70		50			
New York	40	30		25			
New Jersey	75	90			65		
New Hampshire	65	20		60		75	
North Carolina	75	80			85		
Nebraska	75			75	10		
Ohio	50						
Oregon	90	40	60		75	90	50
Oklahoma	100	100			100		
Rhode Island	90	80		90	90		
Pennsylvania	35	70		30	25		
Tennessee	10				20	90	
Texas	75				60		
Virginia					40		
Washington	85	40	40				
West Virginia	70				65		
Wisconsin	50			75		25	

Careful estimates, compiled from final reports made by the commissioners of the five horticultural districts of the state, made in October, of the 1902 fruit crop, are as follows:

Apples	$ 689,000 00
Apples, cured and manufactured into cider and vinegar	100,000 00
Prunes, cured	520,000 00
Prunes, fresh	15,000 00
Peaches	92,000 00
Peaches, cured	10,000 00
Pears	90,000 00
Pears, cured	10,000 00
Grapes	48,000 00
Cherries	33,000 00
Strawberries	162,000 00
*Small fruits (crab apples, apricots, nectarines, plums, raspberries, blackberries, currants, gooseberries)	470,000 00
Total	$2,239,000 00

Notwithstanding the prune crop of the state was forty per cent short of last year's crop, the grand total of fruit products for the year 1902 falls but little short of 1901, the most prosperous fruit year in our history.

Respectfully submitted,

GEO. H. LAMBERSON,
Secretary.

* In districts one, two, and three, strawberries are included in small fruits.

SPRAY CALENDAR.

This calendar has been prepared to answer the question, so often asked, *when to spray*, *what to spray with*, *how to spray*, *and what to spray for*, thus obviating the error to use the wrong spray for any given insect or fungus.

All fruit trees should be sprayed in the fall, as soon as all the leaves have dropped, with sulphur, lime, and salt; if no scale are present, full strength of bordeaux mixture will be found sufficient.

SULPHUR, LIME, AND SALT.

This is a winter spray, and used for all scale insects, pear-leaf blister mite, green aphis, twig borer, bud moth, and clover mite.

HOW PREPARED.

Ingredients—Lime (unslacked), fifty pounds.
Sulphur, fifty pounds.
Stock salt, fifty pounds.
This will make one hundred and fifty gallons of wash.

Directions—Slack fifty pounds of lime, then add the fifty pounds of sulphur, boil it over a brisk fire for one hour, then place all the salt with it in the boiler and boil for fifteen minutes more, then add the necessary water to make one hundred and fifty gallons. This solution should be used at a temperature of at least 100°. Before using, strain it. The utility of this wash depends a great deal upon the strength of the sulphur. It is therefore recommended that those who use this wash have a Beaumes scale for acid. When it shows 8° when cold, it is of the proper strength. These scales can be obtained through any druggist at a cost not to exceed fifty cents.

This combination is the result of Mr. Emile Schanno's extensive experiments in the fourth district.

FOR SAN JOSE SCALE, GREEDY SCALE, AND TURTLE-BACK SCALE.

Sulphur, lime, and salt in the fall as soon as the leaves have dropped, and again in the spring before the buds begin to swell.

FOR GREEN APHIS.

First application with sulphur, lime, and salt in the fall after leaves have dropped, followed in the spring with tobacco wash, as they appear on the trees.

FOR PEAR-LEAF BLISTER MITE.

(*Phytoptus Pyri.*)

Until recently the rough, brown-looking spots seen on the pear trees were passed by as being the fungus that attacks the pear so generally here, but upon closer examination it was found that these spots are the work of this mite. In some localities this pest has gained a strong foothold, and in others it is as yet hardly noticeable. The *Phytoptus pyri* is a microscopic gall mite. It can not be seen with the naked eye, except on a piece of clear glass held up to the light, when it appears as a minute speck. It is not nearly as long as the width of a hair. It is found only on the pear, the leaves of which are exclusively its home. It burrows into the pulp of the leaves, making a cave in which it lives and multiplies. A colony will work out an excavation, which becomes a slight puff or dark-colored gall on the leaf, from a speck to an eighth of an inch in size. The mite keeps open a hole on the under side of the leaf for a doorway. The injury to the tree is caused by the leaves becoming dry and falling. The mite is supposed to desert the leaves after they have fallen, and seek winter quarters upon the tree. It would be a good plan to burn all fallen leaves from affected trees and spray the trees with sulphur, lime and salt solution as soon as the leaves have dropped. In the summer the mite can be destroyed with powdered sulphur, but it can not be expected to rid the tree entirely of the mite by this means, as there are eggs and young in the caves, which the sulphur does not affect. In California they use a seeder on a wagon for throwing the sulphur on the affected trees.

Remedy—Sulphur, lime, and salt before the buds swell, followed by dusting with sulphur when leaves have formed.

FOR TWIG BORER AND BUD MOTH.

Spray in the fall, as soon as all the leaves have dropped, with sulphur, lime, and salt solution, followed up in the spring, as soon as the buds begin to swell, with the following wash: Sulphate of copper, three pounds; lime, four pounds; paris green, four ounces; water, forty-five gallons; and again with the same wash the latter part of May.

FOR CLOVER MITE.

Spray with sulphur, lime, and salt solution in the fall as soon as all the leaves have dropped.

RESIN WASH.

By Professor Koebele.

This is a summer spray for all scale insects, woolly and green aphis.

HOW PREPARED.

Ingredients—Resin, four pounds.
Sal soda, three pounds.

Directions—Place resin and sal soda in kettle with three pints of cold water. Use soft or rain water always. Boil or simmer slowly until thoroughly disolved, when it will look black. The sal soda will adhere to the side of the kettle, and must be scraped down. When it looks dissolved, if there are pieces of resin in the bottom of the kettle it needs more boiling. When sufficiently boiled, add enough hot water to make fifty gallons. After adding the water it will become thick, but after boiling again it becomes thin. The above is ready for immediate use, and should be applied cold or only lukewarm. If desired for future use, boil the above amount of ingredients as directed, and add water to make five gallons; boil until thick. This will stand any length of time, and is always ready for use. When required, use one part or gallon of compound with the following number of gallons of boiling water, and stir thoroughly when applying: For hop louse, one gallon of compound to nine gallons of water; for woolly aphis, one gallon of compound to seven gallons of water; for San Jose scale, one gallon of compound to six gallons of water. The foregoing spray is not injurious to the tree, for after three or four days of sunshine it dissolves and leaves the pores of the bark open.

BORDEAUX MIXTURE.

Used for apple scab, pear scab, leaf blight, apple canker or dead spot, curl leaf on the peach, crater blight on the pear, gummosis, prune or plum rot, and black rot on the grape.

This is the sovereign remedy against injurious fungous diseases, and its use is general throughout the world; therefore the combination of bluestone and lime known as bordeaux mixture is indispensable in fruit growing.

BORDEAUX MIXTURE FOR FUNGI.

Ingredients—Sulphate of copper, six pounds.
Lime, four pounds.
Water, forty-five gallons.

MODIFIED BORDEAUX MIXTURE.

Ingredients—Sulphate of copper, three pounds.
Lime, four pounds.
Water, forty-five gallons.

Dissolve bluestone in a wooden vessel, slack the lime in another vessel or can, put both in a barrel of water and mix thoroughly.

FOR APPLE SCAB, PEAR SCAB, AND LEAF BLIGHT.

First application—Just as the buds are swelling, with bordeaux mixture.

Second application—Just as the fruit buds break open, but before the flowers expand, with bordeaux mixture.

Third application—With bordeaux mixture, when the fruit has attained the size of a hazelnut.

FOR APPLE CANKER OR DEAD SPOT.

Cut out diseased spots clean in the fall when leaves have dropped, and wash with bordeaux mixture; repeat in midsummer if found necessary.

FOR CURL LEAF ON THE PEACH.

Prof. Newton B. Pierce says: "Curl leaf on the peach is caused by a parasitic fungus which is known as *Taphrina*

deformans. The fungus lives within the tissues of the leaf, in the tender shoots, and in the buds. Within the past few months I have learned that lime, sulphur and salt is a satisfactory preventive of this widespread disease. The application of this spray should be made three to five weeks before the buds open in the spring. The treatment should be very thorough; or spray with bordeaux mixture six weeks, and again three weeks later, before the buds begin to swell."

FOR CRATER BLIGHT OF PEARS.

Prof. C. W. Woodworth of Berkeley, California, says: "The nature of the disease is somewhat obscure, but the evidence seems to be that it is caused by an organism, and is very similar to the dreaded eastern pear blight. It is not, however, the same disease. Crater blight first appears as a darkened spot, indistinguishable from any other form of blight. Like other blights, it commonly begins at the point on a branch where a twig is given off, or where one has been. There is this difference however; the crater blight extends out only below the point of origin, whereas in other blights the disease extends upward as well. The most characteristic feature of this blight is the sharp line of demarcation between the dead and live bark. When a spot has ceased to spread there occurs a breaking in the bark, separating the diseased portion. This soon dries, and the spot appears like a crater. The appearance is most striking when isolated spots are seen on the larger branches.

Treatment.—Cut out the dead and diseased tissue, clean and wash with bordeaux mixture; cut off all dead and blackened limbs.

Under date of July 27, 1896, Professor Woodworth adds: "We have made some progress in the study of the disease, in that we are very uniformly able to obtain pure cultures of a peculiar bacillus. Inoculation experiments have so far given only negative results. The disease occurs on many varieties of pears and only a few apples. The crater blight certainly occurs in Oregon. I have had very typical examples from there, and obtained the usual bacterial cultures from it. Economically, the crater blight in most localities is unimportant, but in some places it has done an immense amount of injury."

FOR PEAR SCAB, CRACKING, AND LEAF BLIGHT.

These diseases, caused by two different species of fungi, are successfully combated by one line of treatment. In most sections all three diseases are found associated. Bordeaux mixture has given the best results in this work. The first spraying for these diseases should be made just before the buds swell. In ten or twelve days the second treatment should be given, followed by a third and fourth at the expiration of two and four weeks, respectively. In the nursery, pear blight is often exceedingly troublesome. It may be almost entirely prevented by spraying five or six times with the bordeaux mixture, making the first application when the leaves are about one third grown, and the others at intervals of ten or twelve days throughout the season. The leaf blight of the cherry, plum and quince, which so seriously affects trees, both in the orchard and nursery, may be held in check by using bordeaux mixture.

FOR PRUNE AND PLUM ROT.

Spray with bordeaux mixture as the buds are swelling, and again when the fruit has attained the size of a bean, with modified bordeaux mixture.

FOR GUMMOSIS.

Cut out gum pockets; split the outer bark about one eighth of an inch deep from roots to branches on three sides when sap begins to flow, as all gum infected trees are barkbound, and wash with bordeaux mixture; care must be taken in splitting the bark not to cut through to the wood; repeat in midsummer, if necessary.

FOR BLACK ROT ON GRAPES.

Spray with bordeaux mixture just as the buds are swelling, and again immediately after blooming with modified bordeaux mixture.

LATEST ADVICES ON THE BORDEAUX MIXTURE.

The combination of bluestone and lime, known as the bordeaux mixture, is almost indispensable in fruit-growing and gardening. It is almost a sovereign remedy against injurious fungi, and its use is general throughout the world. The best way to make the preparation is, consequently, a matter of the greatest moment. The division of vegetable pathology of the department of agriculture has just issued a bulletin on these lines which is very timely. It is four years since there was published, in Farmers' Bulletin No. 7, a summary of the more important methods of combating some of the destructive diseases of fruit. During this time many improvements have been made in the work, and for this and other reasons it seems desirable to now bring together, in brief, practical form, our present knowledge on the subject. The question as to whether it will pay to spray has long since been answered in the affirmative, so it is not necessary at this time to enter upon any argument in regard to this phase of the subject. It is, furthermore, not necessary to go into details as to the relation of spraying to hygiene; suffice it to say, that if the work is properly done no danger whatever to health need be apprehended.

Superiority of the bordeaux mixture—During the past four years numerous solutions, powders, etc., have been tested, with a view of determining their value as economical, effective, and practical preventives of fungous parasites. While a number of these preparations have given promise of value, none have been found which fill so many requirements as bordeaux mixture and the ammoniacal solution of copper carbonate. Of the two preparations, bordeaux mixture has long been recognized as possessing the most valuable qualities, and it is probably more generally used to-day than all other fungicides combined. The chief points in its favor are, (1) its thorough effectiveness as a fungicide; (2) its cheapness; (3) its safety from a hygienic standpoint; (4) its harmlessness to the sprayed plant; and (5) its beneficial effects on plants other than those resulting from the mere prevention of the attack of parasites.

Bordeaux mixture formula—All things considered, it is believed that the best results will be obtained from the use of what is known as the fifty-gallon formula of this preparation, as follows:

Ingredients—Water, fifty gallons.
Copper sulphate, six pounds.
Unslacked lime, four pounds.

Must be well made—It has been found that the method of combining the ingredients has an important bearing on both the chemical composition and physical structure of the mixture. For example, if the copper sulphate is dissolved in a small quantity of water and the lime milk diluted to a limited extent only, there results, when these materials are brought together, a thick mixture, having strikingly different characters from one made by pouring together weak solutions of lime and copper sulphate. It is true, furthermore, that if the copper sulphate solution and lime milk are poured together while the latter, or both, are warm, different effects are obtained than if both solutions are cool at the moment of mixing. Where the mixture has been properly made there is scarcely any settling after an hour, while the improperly made mixture has settled more than half.

How to make it—Briefly, the best results have been obtained from the use of the bordeaux mixture, made in accordance with the following directions: In a barrel, or other suitable vessel, place twenty-five gallons of water; weigh out six pounds of copper sulphate, then tie the same in a piece of coarse gunny sack and suspend it just beneath the surface of the water. By tying the bag to a stick laid across the top of the barrel no further attention will be required. In another vessel slack four pounds of lime, using care in order to obtain a smooth paste, free from grit and small lumps. To accomplish this it is best to place the lime in an ordinary water pail and add only a small quantity of water at first, say a quart or a quart and a half. When the lime begins to crack and crumble and the water to disappear add another quart or more, exercising care that the lime at no time gets too dry. Toward the last considerable water will be required, but, if added carefully and slowly, a perfectly smooth paste will be obtained, provided, of course, the lime is of good quality. When the lime is slacked add sufficient water to the paste to bring the whole up to twenty-five gallons. When the copper sulphate is entirely dissolved and the lime is cool, pour the lime milk and copper sulphate solution slowly together into a barrel holding fifty gallons. The milk of lime should be thoroughly stirred before pouring. The method described insures good

mixing, but to complete this work the barrel of liquid should receive a final stirring for at least three minutes with a broad wooden paddle.

Testing the mixture—It is now necessary to determine whether the mixture is perfect—that is, if it will be safe to apply it to tender foliage. To accomplish this two simple tests may be used. First, insert the blade of a penknife in the mixture, allowing it to remain there for at least one minute; if metallic copper forms on the blade, or, in other words, if the polished surface of the steel assumes the color of copperplate, the mixture is unsafe and more lime must be added. If, on the other hand, the blade of the knife remains unchanged, it is safe to conclude that the mixture is as perfect as it can be made. As an additional test, however, some of the mixture may be poured into an old plate or saucer, and while held between the eyes and the light the breath should be gently blown upon the liquid for at least half a minute. If the mixture is properly made, a thin pellicle, looking like oil on water, will begin to form on the surface of the liquid. If no pellicle forms, more milk of lime should be added.

Preparing large amounts—The foregoing directions apply to cases where small quantities of the mixture are needed for more or less immediate use. If spraying is to be done upon a large scale, it will be found much more convenient and economical in every way to prepare what is known as stock solutions of both the copper and lime. To prepare a stock solution of copper sulphate, procure a barrel holding fifty gallons; weigh out one hundred pounds of copper sulphate, and, after tying it in a sack, suspend it so that it will hang as near the top of the barrel as possible; fill the barrel with water, and in two or three days the copper will be dissolved; now remove the sack and add enough water to bring the solution again up to the fifty-gallon mark, previously made on the barrel. It will be understood, of course, that this second adding of water is merely to replace the space previously occupied by the sack and the crystals of copper sulphate. Each gallon of the solution thus made will contain two pounds of copper sulphate, and, under all ordinary conditions of temperature, there will be no material crystalization, so that the stock preparation may be kept indefinitely.

Stock lime may be prepared in much the same way as the copper sulphate solution. Procure a barrel holding fifty gal-

lons, making a mark to indicate the fifty-gallon point; weigh out one hundred pounds of fresh lime, place it in the barrel and slack it; when slacked, add sufficient water to bring the whole mass up to fifty gallons. Each gallon of this preparation contains, after thorough stirring, two pounds of lime.

When it is desired to make bordeaux mixture of the fifty-gallon formula, it is only necessary to measure out three gallons of the stock copper solution, and, after thorough stirring, two gallons of the stock lime; dilute each to twenty-five gallons, mix, stir, and test as already described. One test will be sufficient in this case. In other words, it will not be necessary to test each lot of bordeaux mixture made from the stock preparation, provided the first lot is perfect, and no change is made in the quantities of the material used. Special care should be taken to see that the lime milk is stirred thoroughly each time before applying. As a final precaution, it will be well to keep both the stock copper sulphate and the stock lime tightly covered.

PARIS GREEN SPRAY—ARSENITE OF LIME SPRAY.

These sprays are used for codling moth larvæ, tingis, caterpillars, slugs, and all eating or biting insects.

PARIS GREEN SPRAY.

Proportions for first application—
Paris green, four ounces.
Lime, two pounds.
Water, forty gallons.
Proportions for later applications—
Paris green, four ounces.
Lime, one pound.
Water, fifty gallons.

Directions—Slack the lime; make a paste of the paris green, mix thoroughly, and then add water to make the required amount; stir thoroughly while using, and should be thrown on the leaves and fruit in a fine spray.

Paris green is one of our commercial articles which is shamefully adulterated. The foregoing formula is based upon pure paris green; it is, therefore, of much importance that one be able to detect impurities. So far as we know but two adulterants are used—gypsum and Glauber's salts. The method generally given for the detection of adulteration is to

dissolve a small sample of the paris green in ammonia. If there is any gypsum it will not dissolve, but form a sediment. Glauber's salts can not be be detected by this method, it being equally as soluble as pure paris green ; but if one has a strong microscope at hand the adulterant granules can be easily detected, they being white, while the pure article is green. Ammonia, however, is generally a good test, gypsum being most commonly used as an adulterant.

THE ARSENITE OF LIME SPRAY.

Professor Kedzie's formulæ :

Ingredients—Commercial white arsenic, one pound.
Carbonate of soda, four pounds.
Water, two gallons.

Use one and one half pints to fifty gallons of bordeaux mixture.

Directions—Dissolve one pound of commercial white arsenic and four pounds of carbonate of soda (washing soda) in two gallons of water, and use one and one half pints to fifty gallons of bordeaux mixture. The easiest way to make the solution is to put both the white arsenic and carbonate of soda in a gallon of boiling water and keep boiling about fifteen minutes, or until clear liquid is formed, then dilute to two gallons. One and one half pints of this solution should be added to each barrel of full-strength bordeaux mixture for earlier sprayings, and modified bordeaux mixture for late sprayings, increasing the arsenite solution gradually from one and one half pints to one quart as the season advances and foliage matures. If used without bordeaux mixture or lime, it is liable to burn the foliage. As there is nearly always fungus to contend with, it is recommended that the two sprays be combined, with the additional advantage of making the poison stick longer. Unless combined with bordeaux mixture, it is very important to use enough freshly slacked lime to insure the complete decomposition of arsenite of soda and formation of arsenite of lime. Use six to eight pounds of quicklime, freshly slacked, to a barrel of water.

FOR CODLING MOTH.

Paris green or arsenite of lime. First spraying, ten days after blossoms have fallen, and then at intervals not exceeding three weeks, up to within three weeks of harvesting the apples

or pears. The arsenite of lime is preferably used with bordeaux mixture, and, as the season advances and foliage matures, increase the arsenite solution gradually from one and one half pints to one quart to the fifty gallons of bordeaux mixture.

FOR TINGIS, CATERPILLARS, AND SLUGS.

Spray as they hatch and appear on the leaves.

TOBACCO WASH.

Used for green aphis and tingis as they appear on the trees.

HOW PREPARED.

Ingredients—Tobacco (sheep dip, sulphured tobacco), four pounds.
Whale-oil soap (or good strong soap), four pounds.
Water, twenty gallons.

Directions—Soak the tobacco in hot water for several hours; dissolve the soap in hot water; strain both ingredients; add together and dilute to twenty gallons. On varieties of trees where the foliage is very tender, tests should be made before applying extensively.

KEROSENE EMULSION.

Used for woolly aphis and clover mite.

FOR WOOLLY APHIS.

Spray with kerosene emulsion diluted seven (7) times.

FOR CLOVER MITE.

Spray with kerosene emulsion diluted eight (8) times.

HOW PREPARED—KEROSENE EMULSION (GOVERNMENT FORMULA).

Ingredients—Kerosene, two gallons.
Water, one gallon.
Hard soap, one half pound.

Directions—Make a suds of the soap and water and pour boiling hot into the kerosene; churn with a force pump or a

syringe, pumping out of and into a bucket or barrel through a nozzle until completely emulsified. If the mixture is sufficiently hot it will thicken in from five to ten minutes, and will be, when cold, of the consistency of butter or of soft soap. Dilute with seven to twelve parts of water to one of emulsion, as occasion requires, and this will kill almost anything in the form of plant lice.

FOR CURRANT AND GOOSEBERRY WORM.

Spray the bushes just before blooming, and again after the fruit has set, with one large tablespoonful of powdered white hellebore, dissolved in two and one half gallons of water.

HYDROCYANIC ACID GAS FOR NURSERY STOCK.

Ingredients—C. P. cyanide of potassium, twenty-eight per cent, one ounce.
Sulphuric acid, one fluid ounce.
Water, two fluid ounces.

Directions—First place the vessel in which the gas is to be generated in a convenient place in the shed, and then put in the cyanide of potassium; pour the water over the cyanide, and then add the sulphuric acid very slowly. Close the door and submit the trees to the fumes for about forty minutes. Open the door and allow the gas to escape before attempting to remove the trees, as it is poisonous to inhale.

REMEDY FOR APHIS (LICE) ON CABBAGE, CAULIFLOWER, TURNIPS, ETC.

Ingredients—Quassia chips, one pound.
Whale-oil soap, one pound.
Water, one gallon.

Directions—Boil quassia chips for five hours, then add whale-oil soap, while boiling; when dissolved, dilute to ten gallons of water and spray warm.

PEACH-ROOT BORER.

The worst insect pest of the prune and peach trees in the Willamette Valley, and probably over the entire state, is the peach-root borer. The moth lays its eggs at the base of the

tree in the months of May, June, July, and August. The eggs hatch in about a week, and the worm at once begins to gnaw the bark and bore its way down into the roots. It lives in the root for one year, and comes forth a winged insect the succeeding spring and summer, and lays the eggs for the next brood, as stated. The presence of the worm is always betrayed by the copious exudation of gum, which issues from the roots at the base of the trunk.

Remedies—There are a large number of remedies for this pest which are more or less successful, but where trees are cultivated on a large scale many of the remedies become entirely too expensive. A very popular and successful plan in the peach region of the East is "mounding." Early in the spring, before the moth appears, the earth is drawn about the base of the tree to the height of twelve inches, and removed later in the season, about September 1 in this climate. The use of washes intended to poison the worm have been much used, the following formula being the most successful:

Ingredients—Corrosive sublimate (poison), two ounces.
Hard soap, five pounds to ten gallons of water.
Alcohol, one pint.
Water, sufficient.

Directions—Dissolve the sublimate in the spirits; stir it into the soap solution; add water sufficient to make a good paint; apply with stiff brush from three inches below to six inches above ground. This must be done as soon as the first moth appears in the spring. The worm will be poisoned by the corrosive sublimate almost at the first mouthful. Great care should be observed in using this wash, as it is very poisonous and dangerous to have about the house.

Of all the remedies we have known none has proven so sure and practical as cutting the grubs out with a knife and preventing their return by wrapping. In the fall of the year remove the earth carefully from the base of the tree, locate the worms and cut them out with a knife. Repeat this in the spring about April, and at the same time wrap the trunk of the tree with stiff paper or other close material, allowing it to extend six inches above and three inches below the ground. This will prevent the moth from laying her eggs in the bark, and is the surest way we know of to defeat the ravages of this insect. Raubenleim and dendrolene are used in Europe.

The best wash for borers, all considered, that we have seen or tested, is made by the union of all the above ingredients in the following way: Dissolve as much common washing soda as possible in six gallons of water, then dissolve one gallon of ordinary soft soap in the above and add one pint of crude carbolic acid and thoroughly mix; slack a quantity of lime in four gallons of water, so that when it is added to the above the whole will make a thick whitewash; add this to the above and mix thoroughly, and finally add one half pound of paris green or one fourth pound of powdered white arsenic and mix it thoroughly in the above.—*Prof. J. M. Stedman.*

FOR NURSERY STOCK.

Use sulphur, lime and salt solution as soon as the leaves have dropped; again in spring, as first leaves appear, with modified bordeaux mixture; fumigate all trees and shrubs with hydrocyanic gas before shipping.

RECIPE FOR GRAFTING WAX.

One of the best grafting waxes is made by melting together four parts—by weight—of resin, one part beeswax, one part tallow. When thoroughly melted, pour into cold water; when cool enough, take out and work by molding and pulling until it becomes quite stiff. It is necessary to have the hands well greased with tallow while handling this wax.—*From the Yearbook of the United States Department of Agriculture.*

INSECTS.

Prof. Willis G. Johnson says: "At the present time, spraying is an important part of successful fruit growing. The regular and systematic application of insecticides and fungicides is one of the most valuable and profitable pieces of work done on the farm. The spray-pump, properly used, is worth as much to the growers of fruits and vegetables as the policy covering the insurance on his house or barn. In fact, you must 'insure' your crops from destructive insects and fungi by practicing modern methods of spraying. There has been a decided awakening to the truthfulness of the above statement in the past few years, and thousands of growers are now spraying and seeking information, where only a short time ago they were counted by hundreds."

In order that our readers may understand why one remedy is used for one insect and not for another it will be necessary for us to make some brief references to the structure and habits of certain types. For example, the great mass of injury to plants by insects falls under two heads: *first*, where the plant itself has been eaten; and, *second*, where the juices have been sucked out, leaving the tissues.

Biting insects—Insects causing injury of the first class are called biting or chewing insects, familiar examples of which are the beetles, grasshoppers, and caterpillars, such as the cabbage worm, army worm, etc. They have well-developed jaws, fitted for cutting and chewing the plant. Such insects can be destroyed by use of direct poisons, such as the arsenicals. When applied to the leaves or other parts of the plant it is eaten by the insect, causing its death.

Sucking insects—On the other hand, the second type have long lance-like beaks, fitted for sucking. This class includes the scale insects, plant lice, squash bug, harlequin or terrapin bug, etc. They obtain their food simply by inserting their beaks into the tissues of the plants, sucking the juices from within. The external application of arsenical poisons to plants would have little if any effect upon this group of insects, as the poisons do not enter into the cells of the plants. It is necessary, therefore, to employ some other substances for their destruction. To this end materials are used which will act externally on the bodies of the insects, either as a caustic or to smother or stifle them by closing their breathing organs. I might say in this place that insects do not breathe through their mouths, as do higher animals, but through small openings on either side of the body, called spiracles. By spraying anything of a caustic or oily nature over the body of an insect these spiracles are closed and the creature is destroyed. Sometimes the fumes of poisonous gases are employed to suffocate insects, as will be described later on. Insects are sometimes repelled by obnoxious substances.

The above remarks apply especially to insects which feed upon the exterior of plants or pass the greater portion of their lives in an exposed condition, where they can be readily reached by one of the methods mentioned. Certain other insects, of both classes, biting and sucking, are subterranean in their habits, that is, they feed and live upon the roots of plants below the surface of the ground. Among these the white grub and root lice are common examples. Still other insects live

in stored grain, seeds, and the manufactured product of the mill, and even the mill itself. Here again the arsenics and irritants can not be used and we must resort to various fumes and gases.

FUNGI.

Prof. Charles O. Townsend says:

WHAT IS A FUNGUS?

A fungus (plural fungi) is a low form of plant. It has neither green stem nor leaves and therefore depends for its food upon other plants or upon animals. Sometimes fungi live upon dead plants or animals or upon their products, and sometimes they live upon other living plants or upon living animals. They are very numerous and differ greatly among themselves in form, structure, and habits of life. All fungi sooner or later produce small round or oval bodies, called spores. These spores under favorable conditions produce new fungi. They are not destroyed by ordinary weather conditions and often live over the winter in the fields and orchards. Sometimes they remain alive for several years in the soil and other suitable places, and begin their growth when the conditions are favorable. Many fungi are very small and can be seen only when greatly magnified.

WHAT IS THE HOST-PLANT?

The host-plant is the plant upon which, or in which, the fungus lives and from which it draws its food supplies.

WHAT IS A FUNGICIDE?

A fungicide is any substance which may be used to destroy fungi or their spores, or which will prevent fungi from establishing themselves upon the host-plants. Fungicides may be either solids, liquids, or gases. The most common form of fungicide is liquid; the kind of fungicide used, however, must depend upon the nature of the fungus, the nature of the host-plant, and the part of the host-plant attacked by the fungus.

WHY SHOULD WE SPRAY?

Liquid fungicides are best applied in the form of a fine mist or spray. This is economy, both in the quantity of material used, and in the time required to apply it. The real object in spraying is to prevent the fungous spores that have lodged upon the foliage, branches or fruit, from germinating and producing fungous growths. Every fungus that grows into a leaf or into a fruit, and thus produces the destruction of the former or the decay of the latter, first lodges on the leaf or on the fruit as a tiny spore. If that spore can be destroyed without injury to the leaf or the fruit, disease may be prevented, and therefore the necessity of spraying.

WHY SHOULD WE SPRAY EARLY?

As already stated fungus spores are sometimes formed in the fall and remain in open fields all winter uninjured. These spores often lodge in the crevices of the bark of trees, or in other convenient places on the trunk and branches of trees. When the leaves and fruits appear the spores are blown onto these newly formed parts and cause them to be diseased. The object in early spraying, even while the trees are still dormant, is to kill the spores that are lodged on the tree and waiting for favorable conditions for development. Again, every spore must remain for a longer or shorter time in a domant state, even after it reaches the proper place for its development, just as seeds remain for a little time under proper conditions for germination before they begin their growth. If the leaves or other plant parts are covered with a fungicide before or immediately after the spores are blown onto them, the spores will be destroyed, and the plant will remain free from disease.

WHY IS IT NECESSARY TO SPRAY MORE THAN ONCE?

After a plant has been sprayed new leaves or fruits are often formed, which are not covered with the fungicide. Spores may be lodged on these newly formed parts and develop into fungous growths, causing the parts attacked to be diseased. Or the fungicide originally sprayed onto the plant may be washed off by rains, thus leaving the plant unprotected against the spores that are constantly carried about in the air.

HOW OFTEN IS IT NECESSARY TO SPRAY?

No definite rule can be given in regard to the number of times any set of plants should be sprayed in a single season. The number of sprayings must depend to a large extent upon weather conditions. Warm, damp weather or a dry, hot season followed by rain, are favorable conditions for the development of fungi, hence, if these conditions prevail, it is important that the spraying should be frequent enough to keep well protected the parts liable to attack. Sometimes it is necessary to spray every day or every two or three days, while at other times ten days may elapse between sprayings. Spraying, like cultivation, pruning, and other field operations, is largely a matter of judgment, and the more thoroughly the subject is understood the more effective the work will be.

WHY IS IT NECESSARY TO SPRAY EVERY YEAR?

It is impossible to exterminate fungi. We may hold them in check, or we may even prevent entirely their growth upon certain plants; but they are often so small, their habits of life so variable, and their spores so resistant that extermination is out of the question. It is impossible to know at the beginning of the season whether the conditions will be favorable or unfavorable for the development of fungi, hence, in order to be on the safe side, it is necessary to begin each season with spraying. It is essential, therefore, that spraying should be as regularly a part of the fieldwork for successful crop raising as plowing, fertilizing, and the other operations necessary for crop production. Furthermore, the effects of spraying are cumulative, that is, the effects of spraying and keeping fruit trees free from disease this year will give a better crop next year. Even with trucking crops that die down in the fall the danger from disease next year in a particular field will be greatly reduced if the field is kept free from diseases this season.

DOES SPRAYING SOMETIMES INJURE FOLIAGE AND FRUIT?

If fungicides are not properly made they will burn the foliage and discolor the fruit. It is a well-known fact that the foliage on some plants is much more tender than it is on

others, and for this reason it is necessary to suit the strength of the fungicide to the host-plant. Certain fungicides, like bordeaux mixture, can not be used in spraying fruit that is nearly ripe, since the fruit would be stained by the mixture, and thereby rendered unsalable.

WHY DOES SPRAYING SOMETIMES FAIL TO PREVENT DISEASE?

There are several reasons why spraying sometimes fails to accomplish the results expected. It may be that the fungicide was not properly made, that the spraying was not done early enough in the season, or that the applications were not thorough or persistent enough. If we wait until we see the disease at work before we begin spraying our efforts will not result in success, for the reason that when we see the disease it is certain that the fungus spores have germinated and the fungus has grown into the affected part of the host-plant. In such cases it is impossible to destroy the fungus without destroying the diseased part of the host. The most that can be hoped for in such cases is that the disease may be prevented from spreading to the healthy plants or plant parts. If the spraying is not thorough, so that all parts of the host are covered, spores may fall upon the unprotected parts and grow as readily as if no fungicide had been used; or, if the applications are not frequent enough, so that the fungicide is washed off, or new plant parts are developed and left unsprayed, attacks of fungi may take place as readily as if no spraying had been done. It should be remembered that no fungicide will restore any plant part once destroyed or injured, hence the necessity of preventing attacks of fungi, and this can be done by an early, thorough, and persistent use of fungicides.

WILL SPRAYING PREVENT ALL PLANT DISEASES?

Several plant diseases, of which "peach yellows" is an example, are not, so far as known, produced by organisms, and these diseases can be neither prevented nor controlled by fungicides.

Other plant diseases are produced by bacteria that live in the tissues of diseased plants. These minute organisms seldom appear on the surface of the host-plant and consequently would not usually be reached by spraying. Such a disease is

the pear blight. It is often the case that a disease attacks only the underground portion of the plant. It is clear that a disease of this nature could not be prevented or controlled by spraying. Potato scab is an example of diseases of this kind. In short, it is only those fungous diseases that originate from spores on the above-ground portions of plants that may be prevented by spraying.

WILL IT PAY TO SPRAY?

Whether it will or will not pay to spray must depend upon circumstances. It is of prime importance to know whether the plants under consideration are subject to diseases that may be prevented by spraying. If so, and the crop is worth raising at all, it is worth bringing to the highest possible state of perfection, and it is now well known that spraying, if properly done, is one of the important factors in perfect crop production. However, unless one makes up his mind to use all possible pains in the preparation of fungicides, to begin spraying early and to carry it on persistently, the time, labor and money expended will be lost. On the other hand, if the fungicide is properly prepared and the work is timely and thorough, it is probable that no equal amount of labor and money expended will yield larger returns, taking it year in and year out. This statement has been demonstrated many times by farmers, gardeners, and fruit growers in nearly every section of the state. It is true that certain seasons are unfavorable for the development of fungi, but it rarely happens that they do not develop to some extent; hence it will be an advantage to spray even during such seasons. Experience has shown that it pays to spray systematically and thoroughly, year after year, regardless of the season.

PLANTING TABLE.

So many mistakes have been made in planting trees too close together, that again we give a general table, taking in consideration the strength of soil, variety and nature of the tree, as well as climatic conditions :—

DISTANCES.

	Feet.
Pears	24 to 30
Apples	30 to 40
Apricots	20 to 22
Cherries	25 to 30
Peaches	20 to 25
Prunes and plums	20
Nut-bearing trees	30 to 40

NUMBER OF TREES TO THE ACRE.

	Square.	*Triangular.*	*Quincunx.*
Ten feet	436	500	831
Twelve feet	303	347	571
Fourteen feet	222	255	415
Sixteen feet	170	195	317
Eighteen feet	134	154	249
Twenty feet	108	126	193
Twenty-two feet	90	103	177
Twenty-four feet	76	86	133
Thirty feet	48	56	83
Forty feet	27		

SPRAY FORMULAS.

REQUISITES FOR SUCCESSFUL SPRAYING.

Materials of standard strength, carefully compounded, applied in thorough manner at regular intervals. Fruit thinned so that the spray liquid can reach every portion of that remaining on the tree.

INSECTICIDES.

Used for codling moth larvæ, caterpillars, slugs, and all biting and chewing insects.

SPRAY NO. 1—ARSENITE OF SODA.

1 pound of white arsenic.
2 pounds of sal soda.*
1 gallon of water.

Directions—Boil fifteen minutes, add amount of water equal to that evaporated, giving one gallon of arsenite of soda. For fifty gallons of water use one and a half pints of the arsenite of soda and six pounds of freshly slaked lime. Can be used safely.

SPRAY NO. 2—PARIS GREEN.

1 pound paris green.
½ pound quick lime.
200 gallons water.

Slake the lime in part of the water, sprinkling in the paris green gradually, then add the rest of the water. For the peach and other tender-leaved plants use three hundred gallons of water. Keep well stirred while syraying.

SPRAY NO. 3—ARSENITE OF LIME.

1 pound white arsenic.
2 pounds fresh burned lime.
1 gallon water.

*In Western Oregon, and moist sections, use three instead of two pounds of sal soda.

Boil together for forty-five minutes and keep in a tight vessel. Add one quart of this to a barrel (fifty gallons) of water for use.

This insecticide has been recommended by a number of experiment stations.

INSECTS THAT SUCK THE JUICES OF FRUIT OR TREES.

SPRAY NO. 4—SULPHUR, LIME, AND SALT.

Oregon Formula.

50 pounds unslaked lime.
50 pounds flower of sulphur.
25 pounds common salt.*

Slake the lime in enough water to do it thoroughly; add the sulphur and boil for an hour at least, adding water if necessary. Then add the salt and boil fifteen minutes more. Add water to make one hundred and fifty gallons and spray hot through a coarse nozzle.

SPRAY NO. 5—SULPHUR, LIME, AND SALT.

Marlatt's Formula (from Smith).

30 pounds unslaked lime.
30 pounds sulphur.
15 pounds salt.
60 gallons water.

Boil with steam for four hours and apply hot.

SPRAY NO. 6—WHALE-OIL SOAP, OR QUASSIA CHIPS.

Boil one pound of soap dissolved in four gallons of water; or, boil for two hours one pound of quassia chips; add water to extract to make four gallons.

FUNGICIDES.

SPRAY NO. 7—BORDEAUX MIXTURE.

6 pounds copper sulphate (blue vitriol).
6 pounds lime (unslaked).
50 gallons water.

Dissolve the copper in hot or cold water, using a wooden or earthen vessel. Slake the lime in a tub, adding the water

*Exhaustive experiments at Illinois station prove that spray No. 4 will be more effective by substituting for the salt one and one half pounds sulphate of copper for each fifty gallons of water.

cautiously and only in sufficient amount to insure thorough slaking. After thorough slaking more water can be added and stirred in until it has the consistency of thick cream. When both are cold pour the lime into the diluted copper solution of required strength, straining it through a fine mesh sieve or gunny cloth, and thoroughly mix.

It is then ready for use. Considerable trouble has frequently been experienced in preparing the bordeaux mixture. Care should be taken that the lime is of good quality and well burned, and has not been air slaked. Where small amounts of lime are slaked it is advisable to use hot water. The lime should not be allowed to become dry in slaking, neither should it become entirely submerged in water. Lime slakes best when supplied with just enough water to develop a large amount of heat, which renders the process active. If the amount of lime is insufficient, there is danger of burning tender foliage. In order to obviate this the mixture can be tested with a knife blade or with ferro-cyanide of potassium (one ounce to five or six ounces of water). If the amount of lime is insufficient, copper will be deposited on the knife blade, while a deep brownish-red color will be imparted to the mixture when ferro-cyanide of potassium is added. Lime should be added until neither reaction occurs. A slight excess of lime, however, is desirable.

The bordeaux mixture is best when first prepared. Stock solutions of lime and copper can be made and mixed when required.

SPRAY NO. 8—BORDEAUX MIXTURE WHEN TREES ARE IN FOLIAGE.

3 pounds of sulphate of copper.
6 pounds of lime.
50 gallons of water.

SPRAY NO. 9—COPPER SULPHATE SOLUTION.

(Strong solution for dormant trees).

1 pound of copper sulphate.
25 gallons of water.

SPRAY NO. 10—COPPER SULPHATE FOR SUMMER SPRAY.

4 ounces of copper sulphate.
50 gallons of water.

SPRAY NO. 11—FORMALIN. (FOR POTATO SCAB.)

8 ounces formalin (forty per cent solution).
15 gallons of water.

Immerse seed potatoes for two hours.
(Not poisonous.)

COMBINED FUNGICIDE AND INSECTICIDE SPRAYS.

SPRAY NO. 12.

4 ounces of paris green.
50 gallons of bordeaux mixture.

SPRAY NO. 13.

1½ pints of arsenite of lime.
50 gallons of bordeaux mixture.
(*See Formula No. 3.*)

SPRAY NO. 14.

1½ pints of arsenite of soda.
50 gallons of water.
(*See Formula No. 1.*)

FOR ROSE MILDEW, RED SPIDER, AND PLANT LICE.

1 pound bar ivory soap.
15 gallons of water.

Apply warm, as it thickens after cooling.

SPRAY CALENDAR.

	First application.	*Subsequent applications.*
Apples.		
Apple scab	Use spray No. 9 before buds swell	Use spray No. 8 when buds are swelling.
Bitter rot	This disease may be treated in essentially the same way as scab. As the bitter-rot fungus often continues its destructive work after the fruit is harvested, care should be taken in storing to remove all fruit showing evidence of the disease.	
Codling mot	Use No. 1 or No. 2 one week after blossoms fall	Repeat at intervals of two weeks, up to within three weeks of harvest.
Scale	Use No. 4 or No. 5 when trees are dormant.	
Aphis	Use No. 6 as soon as eggs hatch	Use No. 6 whenever aphis appear on foliage.
Apple canker or dead spot	Cut all dead and diseased tissue, clean and wash with bordeaux mixture.	
Collar rot or mushroom disease	Dig a trench around the tree, cutting off all roots, as the disease is communicated from tree to tree through the roots; destroy all affected trees.	
Cherry.		
Aphis	When aphis appear use spray No. 6.	
Cherry slug	When fruit has set, if slug appears, dust leaves with air-slaked lime.	
Gummosis	Cut out gum pockets, split outer bark from roots to branches when sap begins to flow; wash with bordeaux mixture.	
Pears.		
Scale, codling moth, and scab	Use same sprays as for apple.	
Leaf blight	Use spray No. 8.	
Peach.		
Curl leaf	Spray with No. 7 before buds open	Spray with No. 8 after blossoms fall.
Raspberries, Blackberries, Dewberries.	Use No. 8 as buds begin swelling.	
Rust and anthracnose	Use either No. 12 or No. 13 just before blossoms open.	

NOTE.—Bordeaux mixture is a sovereign preventive for all fungous growths, using the modified form when trees are in foliage.

NOTE.—Lime should always be fresh slaked and the combined fungicide and insecticide sprays should be used soon after making.

RESOLUTIONS OF RESPECT.

Whereas, our brother commissioner and fellow-worker Emile Schanno, having completed his earthly labors and gone to his last rest; be it

Resolved, that we, the members of the State Board of Horticulture, do sincerely mourn his loss, and feel that in his death the State of Oregon has lost a faithful and worthy citizen, and the fruit growers an ardent helper, and we, personally, an esteemed member of the board, whose courtesies were always helpful.

We extend our sympathies to the bereaved family, and move that these resolutions be placed on the minutes and become a part of the official records.

W. K. NEWELL,
A. H. CARSON,
Committee.

THE LATE EMILE SCHANNO, COM. 4TH DISTRICT—1902.

ACKNOWLEDGMENTS.

With the publication of this volume the labors of the writer as president of the Oregon State Board of Horticulture will practically cease.

For the past six years he has been identified with the horticultural interests of the state, three years as president of the State Horticultural Society and a like term and relation with the State Board of Horticulture.

These positions have been profitable only in the sense that they brought him in contact with better pomologists than himself, thereby adding to his own scant store of knowledge. He has also greatly enjoyed the social fellowship of the professors of the experiment stations and of leading fruit growers of Oregon and adjacent states, and when he recalls these pleasant associations he forgives the gentlemen who induced him to accept these positions.

To Secretaries Dosch and Lamberson, for prompt and invaluable services, to the commissioners of our five horticultural districts for earnest and intelligent co-operation, to the press, which has popularized the papers and bulletins of this board, to the Southern Pacific and Oregon Railway and Navigation Companies, for courtesies that practically supplemented the modest appropriation of the state, and to our fruit growers, whose hospitality he has enjoyed, and who have taught him much, he would make grateful acknowledgment.

E. L. SMITH.

Hood River, January, 1903.

APPENDIX.

BACK ON THE FARM.

When the roar of the city comes up from the street,
There rises a vision ineffably sweet
Of a scene far away, of a dear, tranquil spot—
My old childhood home that shall ne'er be forgot.
It is long, long ago since I bade it good-by,
With a quivering lip, with a tear in my eye,
And through all the years that have passed comes the charm
Of those olden, those golden days back on the farm.

Do the violets there in the meadow still grow?
Does the little brook still through its leafy haunts flow?
Are the fields just as green, are the forests as cool?
Do the minnows still shimmer and flash in the pool?
Ah, that dear scene, the fairest I ever looked on,
I know is unchanged, though some loved ones are gone.
It has still the old grace, it has still the old charm,
With the world at its happiest, back on the farm.

Some day when this struggle, this turmoil, shall cease,
And, weary, I long for a haven of peace,
May fate guide my footsteps again to the place
The mem'ry of which time can never efface.
Let me pass in its calm the last years of my life,
Far away from the town with its feverish strife.
May the old roof-tree shelter me, safe from all harm,
While I rest, like a tired child, back on the farm.

—Malcolm Douglas.

REVISED CATALOGUE OF FRUITS

RECOMMENDED FOR CULTIVATION IN THE VARIOUS SECTIONS OF THE UNITED STATES AND THE BRITISH PROVINCES

BY THE

AMERICAN POMOLOGICAL SOCIETY.

REVISED BY A COMMITTEE OF THE SOCIETY.

W. H. RAGAN, CHAIRMAN.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
Division of Pomology,
Washington, D. C., June 15, 1899.

Sir: In my letter of transmittal of August 18, 1897, accompanying the matter embraced in Bulletin No. 6 of this division, the mutual arrangement that had been entered into between the Department of Agriculture and the American Pomological Society was fully set forth. The relationship thus established still exists, and the bulletin has been carefully revised and compiled for publication under the joint auspices of the society and the division. I now, therefore, have the honor to submit to you this revision and trust that you may authorize its early publication.

As heretofore this revision has been made by a regularly appointed committee of the American Pomological Society, of which Prof. W. H. Ragan is chairman, and Mr. T. T. Lyon, Prof. E. J. Wickson, Prof. C. S. Crandall, Mr. Silas Wilson, and Mr. L. A. Berckmans are members.

Owing to the varied conditions of soil, climate, and elevation of the Pacific coast region it was thought advisable to make special investigation of the pomological conditions in that section, and Prof. E. J. Wickson, of California, was accordingly appointed a special agent of this division for that purpose, and to him special credit is due for his valuable services rendered.

While it is manifestly impossible to construct a general fruit list that will constitute an infallible guide to the planter, it is hoped and believed that this revised catalogue of fruits will be of service to him in the selection of varieties adapted to his own locality.

With the above explanations I have the honor to recommend the publication of this catalogue as Bulletin No. 8 of this division.

Very respectfully,

G. B. BRACKETT, Pomologist.

Hon. JAMES WILSON,
Secretary of Agriculture.

In accordance with agreement, publication as recommended is hereby authorized.

JAMES WILSON,
Secretary of Agriculture.

INTRODUCTION.

The revised Catalogue of Fruits prepared under the joint auspices of the American Pomological Society and the division of pomology of the United States Department of Agriculture is herewith submitted.

In making this revision the chairman of the committee on revision has availed himself of the experience of his able predecessor, Hon. T. T. Lyon, and, through correspondence, of many practical pomologists. Many sources of information have been sought and repeated efforts have been made to secure accurate and conservative opinion on the merits of varieties and their adaptability to the several districts. But notwithstanding these efforts the chairman of your committee is aware that this revision is not without defects.

The highest aim and desire of your committee has been to present reliable data concerning the behavior of varieties in various sections of our country. If this desire has not been realized it has been largely due to the difficulties experienced in outlining districts sufficiently homogeneous in soil, climate, and other important features, and in securing responses to the numerous inquiries sent out to practical fruit growers. While these difficulties have been quite real, it is yet due the fruit growers to say that they are as a class very generous in giving out information gathered through their experience.

Actuated by a desire to make the work as reliable as possible and therefore a safe guide to planters and others seeking such information, the work of this revision has been done at Washington, where easy access could be had to the library and records of the division of pomology as well as opportunity for frequent consultations with the pomologist and his corps of assistants. All uncertainties of origin, nomenclature, etc., have been carefully investigated with a view to arriving at correct conclusions.

The general plan of the catalogue is based on that of its immediate predecessor, which was largely the work of that eminent pomologist, the former chairman of your committee on revision, Hon. T. T. Lyon, of Michigan. The districts have been somewhat changed in boundaries and increased in number, in order, if possible, to conform more closely to practical as well as scientific principles. The map has also been enlarged and the boundaries of the districts made more distinct.

In view of the lack of knowledge on the part of any but a resident expert concerning the behavior of varieties and the true status of fruit growing in that section of our country bordering on the Pacific coast, Prof. E. J. Wickson, of the University of California, was appointed by the pomologist to prepare that portion of the catalogue which is embraced in districts Nos. 15, 16, 17, 18, and 19, and this revision is based almost wholly on his report. The thanks of your committee are extended to Professor Wickson for his valuable services.

The list of public-spirited fruit growers generously contributing assistance is too large to attempt individual acknowledgment, but on behalf of the society and its committee, I feel bound to refer especially to the invaluable aid of Colonel Brackett and his able assistant, Mr. William A. Taylor.

Respectfully submitted,

W. H. RAGAN, Chairman.

PLAN OF THE CATALOGUE.

This catalogue embraces species and varieties of fruits and nuts recommended for cultivation in the United States and the British American provinces. These are arranged alphabetically in three divisions, as follows:

Division 1. Species and varieties mainly adapted to culture in the Northern and Middle states of the Union and in adjacent portions of the British provinces.

Division 2. More southern, tropical, and subtropical species and varieties.

Division 3. Species indigenous and introduced, not included in the foregoing, which have not deviated under cultivation so far from their original types as to have deserved varietal names.

The entire territory represented is divided into nineteen pomological districts, with little regard to state or provincial boundaries, but with primary reference to the influence of latitude, elevation, prevailing winds, and oceanic and lacustrine exposures upon their adaption to pomological pursuits (see map).

Size and quality, as usually expressed in pomological phraseology, are stated in the tabulations of varieties upon the scale of 1 to 10, as follows:

SCALE OF SIZE AND QUALITY.

Size.	*Scale.*	*Quality.*
Very small	1	Very poor.
Small	2–3	Poor.
Small to medium	3–4	Poor to good.
Medium	5–6	Good to very good.
Medium to large	7–8	Very good.
Large	8–9	Very good to best.
Very large	10	Best.

District No. 1.—Maine above five hundred feet elevation; New Hampshire, Vermont, and New York north of latitude forty-four degrees; Ontario north of Lake Simcoe and east of longitude eighty degrees; Quebec, New Brunswick, and Prince Edwards Island. The dominant natural feature of this district is the St. Lawrence valley. Many of the hardier fruits flourish within its borders.

District No. 2.—Nova Scotia; Maine below five hundred feet elevation; New Hampshire and Vermont south of latitude forty-four degrees; Massachusetts; Rhode Island; Connecticut; New York south of latitude forty-four degrees, except Long Island; northern New Jersey above five hundred feet elevation; Pennsylvania east of the Susquehanna river and above five hundred feet elevation, north of latitude forty-one degrees west to the Allegheny river, and all of that portion of the state lying

north of the Ohio river; Ohio and Indiana north of latitude forty degrees; and the lower peninsula of Michigan. The Annapolis valley of Nova Scotia, the North Atlantic coast, the lake region of western New York, Ohio, and Michigan, and the Hudson river valley are the leading features of district No. 2. This may be considered the northern grape, peach, and winter apple district.

District No. 3.—Long Island; New Jersey, except a small portion north; eastern Pennsylvania below five hundred feet elevation; Delaware; and Maryland and Virginia below five hundred feet elevation. This is the Delaware and Chesapeake Bay district. Though a small district, its productive capacity is great of the fruits that succeed within its borders.

District No. 4.—Pennsylvania above five hundred feet elevation and south of latitude forty-one degrees; Maryland, Virginia, North Carolina, South Carolina, Georgia, Mississippi, and Alabama above five hundred feet elevation; West Virginia; Tennessee and Kentucky; Ohio and Indiana south of latitude forty degrees; southern Illinois below the general elevation of five hundred feet, from the Wabash to the Mississippi; Missouri south of a line from near St. Louis and along the elevation of one thousand feet to the southeast corner of Kansas; Oklahoma below two thousand feet elevation; Indian Territory; and Arkansas north of latitude thirty-five degrees, also south of it wherever the elevation exceeds five hundred feet. The Allegheny and the Ozark mountains and the valleys of the Ohio, the Tennessee, and the Cumberland, and portions of the Wabash, the Mississippi, and the Arkansas rivers are embraced within this district. Portions of it are noted fruit regions, while throughout its vast territory the hardier deciduous fruits flourish. Many of the varieties recommended succeed best in certain localities within the district. An exception to the general character of the district occurs in those portions of Kentucky, Tennessee, Arkansas, and southeastern Missouri lying near the Mississippi river, where varieties adapted to culture in districts 5 and 7 generally succeed.

District No. 5.—Eastern North Carolina, South Carolina, and Georgia below five hundred feet elevation; and Florida north of latitude thirty degrees east of the Chattahoochee river and above one hundred feet elevation. This district embraces the southern Atlantic seaboard, with its many frith-like indentations and valleys. The climate is generally mild, and within its borders many of the more tender deciduous fruits flourish.

District No. 6.—Florida south of latitude thirty degrees, and the remaining portions of the state with elevations below one hundred feet, and those portions of Alabama, Mississippi, Louisiana, Arkansas, and Texas, lying below the one hundred-foot contour line as it skirts the coast from Florida to the Rio Grande. This is the Southern Peninsula and the Gulf Coast district. The successful culture of citrous and other subtropical fruits and nuts is restricted to the peninsula portion of Florida and to the delta of the Mississippi. Tropical species are only recommended for that portion of Florida lying south of latitude twenty-seven degrees, and are indicated by the letter "s" in connection with the starring.

District No. 7.—Florida west of the Chattahoochee river and above one hundred feet elevation, Alabama, Mississippi, Louisiana, and Arkansas above one hundred and below five hundred feet elevation; and Texas south of Red river and above one hundred and below one thousand feet elevation. This may be denominated the valley district. It embraces portions of the Chattahoochee, Alabama, Pearl, Mississippi, Arkansas, Red, Sabine, Colorado, and Rio Grande valleys. The climate in the eastern and larger portion is warm and moist, in the extreme west more dry and tending toward aridity. A wide range of the more tender varieties and species is adapted to culture in the district.

District No. 8.—Illinois north of the five hundred-foot contour line as it crosses the state between thirty-eight degrees and thirty-nine degrees latitude; a small portion of southwest Wisconsin; Iowa south of about latitude forty-two degrees, thirty minutes; the Missouri river valley portion of southeastern South Dakota; Nebraska and Kansas below two thousand feet elevation; and Missouri north of a line drawn from near St. Louis and along the elevation of one thousand feet to the southeast cornear of Kansas. The Missouri and Mississippi valley sections of the district are its dominant features. The hardy deciduous fruits succeed in most portions, and commercial fruit growing is a rapidly developing industry.

District No. 9.—Wisconsin except the southwest corner; Minnesota; upper Michigan; Iowa north of about latitude forty-two degrees thirty minutes; North and South Dakota east of longitude ninety-nine degrees; and the British provinces west of longitude eighty degrees and east of longitude ninety-nine degrees. This district embraces the upper lakes, including Winnipeg, the Upper Mississippi, and the Red river valleys. Only the hardier fruits succeed, but fair progress has been made in recent years in developing varieties adapted to this region.

District No. 10.—Nebraska, Kansas, and Oklahoma above two thousand feet elevation; Texas above two thousand feet elevation and north of Red river and latitude thirty-five degrees; also Colorado below five thousand feet. This is the central plain and foot hill district. It lies on the eastern slope of the Continental divide. There are small sections, especially in eastern Colorado, where the apple and other hardy fruits are very successfully grown.

District No. 11.—Texas above one thousand feet and south of Red river and latitude thirty-five degrees; and east of longitude one hundred and three degrees and the Pecos and Rio Grande rivers. This may be accepted as an extension southward of District No. 10, with very similar conditions but a warmer and more southern climate.

District No. 12.—Texas west of longitude one hundred and three degrees and the Pecos river, and New Mexico south of latitude thirty-five degrees. The Pecos and Rio Grande valleys are the characteristic features of this district. Considerable effort at growing fruit, especially the apple and the hardier vinifera grapes, is being made in many localities.

District No. 13.—New Mexico and Arizona north of latitude thirty-five degrees; Utah; and Colorado above five thousand feet elevation. This district embraces the Continental Divide and the Great Salt Lake, and it also embraces the valley and canyon of the Colorado and the sources of the important streams south of the Missouri and Yellowstone. It affords a great diversity of soils and climatic conditions, and hence a wide range of fruit growing. The species successfully grown within the boundaries of this district range from the vinifera grapes to the hardy ironclad apples.

District No. 14.—The Dakotas west of longitude ninety-nine degrees; Wyoming; Montana east of longitude one hundred and eleven degrees; and the British provinces lying between longitude ninety-nine and one hundred and eleven degrees. The upper Missouri and Yellowstone valleys are the distinctive features of the district. There is perhaps no section of the district in which fruitgrowing has reached a very high state of development. Leading causes of this condition may be found in the comparatively undeveloped, or unsettled, state of the country and its great elevation.

District No. 15.—British America west of longitude one hundred and eleven degrees and east of longitude one hundred and twenty-two degrees; Montana west of longitude one hundred and eleven degrees; Idaho; Nevada; and Washington, Oregon, and California east of the general coast contour line of one thousand feet elevation, commencing at the British boundary near longitude one hundred and twenty-two degrees and southward on said elevation to its intersection of the Southern Pacific railway in the upper Willamette valley, thence along the line of said railway to the Sacramento valley, thence east and south on the eastern rim of said valley and that of the San Joaquin at an elevation of one thousand feet to latitude thirty-five degrees, thence east on said latitude to the Colorado river. The characteristic features of this district are the upper Columbia valley and the Sierra Nevada mountains. An exception to the general recommendation will appear in certain portions of Snake river valley, where the vinifera grapes and other tender fruits succeed.

District No. 16.—The coast section of British America west of longitude one hundred and twenty-two degrees and of Washington, Oregon, and California north of about latitude thirty-nine degrees thirty minutes, and bounded on the east by districts Nos. 15 and 17. This district embraces the highly developed fruitgrowing sections on Puget Sound, the lower Columbia, and the Willamette.

District No. 17.—The Sacramento and San Joaquin valleys, bounded on the east by district No. 15, and on the west by the western rim of this great interior basin. The diversified fruit and nut products of this district are marvelous. There are localities in which the semitropical species and others in which the apple, pear, and other hardy fruits and nuts are grown to the highest perfection.

District No. 18.—The coast section of California lying between latitude thirty-five degrees and about thirty-nine degrees thirty minutes and bounded on the east by district No. 17. Its characteristic features are the Coast range of mountains, the Russian river, the Sonoma, the Santa Clara, and the Pajaro valleys.

District No. 19.—California and Arizona south of latitude thirty-five degrees. The dominant characteristics are the valleys of the Gila, the Colorado, the San Gabriel, and the Santa Ana and the Sierra Madre mountains. It includes the celebrated fruit districts of Santa Ana, Riverside, Santa Barbara, the Salt river valley, San Diego, and many others.

Districts 16, 17, 18, and 19 are peculiarly adapted to fruit and nut culture. Perhaps no portion of the earth's surface is more highly favored in climate and soil and affords a wider range of crop products than that lying within the boundaries of these four districts. The commercial value of the fruit and nut products of this section are already felt and recognized the world over.

REVISED CATALOGUE OF FRUITS.

This division includes such cultivated species, commonly designated "hardy" fruits and nuts, as have developed distinct varieties which are propagated on a commercial scale by some of the various methods of bud propagation.

FRUITS MAINLY ADAPTED TO NORTHERN LOCALITIES.

[KEY.—Size, scale 1 to 10: 1, very small; 10, very large. Form: c, conical; i, irregular; o, oblate; ob, oblong; ov, ovate; r, round. Color: d, dark; g, green; r, red; ru, russet; s, striped; w, white; y, yellow. Flavor: a, acid; m, mild; s, sweet. Quality, scale 1 to 10: 1, very poor; 10, best. Season: e, early; m, medium; l, late; v, very. Use: c, cider; d, dessert; k, kitchen; m, market. Abbreviations of names of places of origin: Am., America; Eng., England; Eur., Europe; Fr., France; Ger., Germany; Holl., Holland; Ont., Ontario; Rus., Russia; Scot., Scotland.]

APPLES. (*P. MALUS.*)

Name.	*Description.*							
	Size.	*Form.*	*Color.*	*Flavor.*	*Quality*	*Season*	*Use.*	*Origin.*
Alexander	9-10	oc	yrs	a	5	m	km	Rus.
Anisim	4-5	rc	yr	m	7	m	dm	Rus.
Antonovka	6	ovc	y	ma	7	m	km	Rus.
Arctic	7-8	rc	yr	------	8	l	km	N. Y.
Arkansas (*Arkansaw, Mammoth Black Twig*)	7-8	ro	yr	m	7-8	l	km	Ark.
Arnold	5-6	o	yr	m	5-6	l	dm	Ont.
Autumn Bough	5-6	rc	gy	s	5-6	m	d	Am.
Autumn Swaar	6-7	rc	yrw	m	5-6	em	d	Am.
Babbitt (*Western Baldwin*)	5-6	r	r	------	5-6	l	dkm	Mo.
Bailey *Sweet*	8-9	r	r	s	7-8	l	dm	N. Y.
Baker	8-9	roc	yr	m	5-6	l	cm	Conn.
Baldwin	7-8	roc	yr	m	5-6	l	km	Mass.
Beach (*Richardson's Red, Apple of Commerce*)	7-8	ob	r	------	9	vl	m	Ark.
Belmont (*Waxen*)	6-7	rc	yr	m	9	l	d	Pa.
Belle Bonne	7-8	rov	gy	------	8-9	l	km	Fr.
Ben Davis	6-9	rov	yrs	m	4-5	l	m	Ky.
Benoni	4-5	ro	yrs	m	8-9	e	d	Mass.
Bentley	5-6	ra	ygr	s	5-6	vl	k	Va.
Bethel	7	oc	ys	------	8-9	l	m	Vt.
Bietigheimer	8-10	oc	wgr	m	4	em	m	Ger.
Black, *Jersey*	5-6	ro	dr	m	4-5	l	d	N. J.
Bledsoe	7-8	o	s	------	7	me	km	Tex.
Blenheim	8-9	roc	yrs	ma	4	ml	km	Eng.
Blue Pearmain	8-9	rc	drs	m	6	l	dm	Am.
Bogdanoff	6-7	ov	ry	------	6-7	l	dkm	Rus.
Bonum	5-6	o	yr	m	6	ml	d	N. C.
Borovinka	6	rob	yrs	ma	7	em	km	Rus.
Bough, *Sweet*	7-8	rc	y	s	7-8	e	d	Am.
Bradford (*Kentucky Redstreak*)	5-6	rc	yrs	m	4	l	dm	Tenn.
Broadwell	6	oc	yr	s	7	l	dk	Ohio.
Bryan, *Mrs.*	7-8	c	or	------	9	me	dkm	Ga.
Buckingham (*Fall Queen*)	6-8	oc	gyr	m	7-8	l	km	Va.
Bullock (*American Golden Russet*)	3-4	oc	yru	m	8-9	l	d	N. J.
Buncombe (*Red Winter Pearmain*)	5-6	robc	wyr	m	4-5	ml	dm	N. C.
Camack	5-6	rc	yrg	s	4	l	dk	N. C.
Canada Baldwin	5-6	rov	r	------	5-6	l	k	Can.
Canada Reinette	7-8	oci	gru	m	7-8	l	dm	Fr. ?
Cannon *Pearmain*	5-6	rc	yrs	m	4-5	vl	dm	N. C.
Carlough	7-8	rc	gy	------	5-6	l	m	N. Y.
Carolina Beauty	5-6	rob	dr	------	7	l	km	N. C.
Carter Blue	6-7	ro	gr	m	5-6	m	d	Ala.
Champlain (*Nyack*)	7	rob	yr	m	5-6	em	dm	N. Y.
Charlamoff	5-6	rc	grs	a	6	e	dm	Rus.
Chenango	6-7	obc	yr	m	8	e	dm	N. Y.
Christmas	4-5	r	yrs	a	6	m	dk	Rus.
Clark Pearmain	5-6	roc	gyr	m	5-6	m	dm	N. C.

APPLES—CONTINUED.

Name.	Description.							
	Size.	*Form.*	*Color.*	*Flavor.*	*Quality*	*Season*	*Use.*	*Origin.*
Clayton	6–8	oc	yrs	m	6–7	vl	km	Ind.
Clyde *Beauty*	6–8	roi	gr	m	4	l	m	N. Y.
Cogswell	7–8	ro	yr	m	7	l	dm	Conn.
Collins (*Champion*)	6	o	s	------	7	l	m	Ark.
Colton, *Early*	5–6	r	y	------	7	e	d	--------
Cooper	8	roi	yrs	m	4	m	m	Am. ?
Cooper Market	5–6	oc	yrs	m	4	l	m	N. J.
Cornell *Fancy*	5	obc	yrs	m	6–7	em	d	Pa.
Cracking	7–9	roc	yr	m	4	m	k	Ohio
Cross	5	obc	yr	m	6	m	km	Rus.
Cullasaga	6–7	rc	yr	m	4	l	m	N. C.
Danvers *Sweet*	5–6	rob	y	s	5–6	l	km	Mass.
Derby	6–7	i	r	------	7–8	l	dm	Vt.
Domine	6–7	o	gyr	m	5	l	m	N. Y.
Donneghan	5–6	r	wrg	s	7–8	me	dkm	Vt.
Doyle	8	------	------	------	------	me	------	Tex.
Dutch Mignonne	5–6	roc	yr	m	4–5	l	dk	Holl.
Dyer (*Pomme Royal*)	5–6	r	yr	m	9–10	em	d	Fr. ?
Early Cooper	5–6	ro	yr	m	5	e	m	Am.
Early Harvest	5–6	ro	yw	ma	9	ve	dk	Am.
Early Joe	3–4	oc	yrs	m	8–9	e	d	N. Y.
Early Pennock	7–8	rc	yr	m	4–5	e	km	Am.
Early Ripe	5–6	ro	y	m	3–4	e	dm	Pa.
Early Strawberry	3–4	rc	yrs	m	6–7	e	dm	N. Y.
English Russet	5–6	rc	yru	m	5–6	vl	m	(?)
Esopus *Spitzenburg*	6–8	obc	r	m	10	l	d	N. Y.
Evening Party	4–5	o	yrs	m	5–6	l	d	Pa.
Ewalt	8	rc	yr	m	4–5	l	k	Pa.
Fallawater (*Tulpehocken*)	9–10	rc	ygr	m	6	l	m	Pa.
Fall Harvey	7–8	roi	yr	m	4–5	m	dk	Mass.
Fall Jenneting	7–8	olc	yr	m	3–4	m	m	Conn.
Fall Orange	8–9	r	yr	ma	3–4	m	k	Mass.
Fall Pippin	7–9	roc	yr	m	9	m	dk	Am.
Fall Wine	5–6	ro	yr	m	8–9	m	d	Am.
Famense (*Snow*)	5–6	ro	yrs	m	8–9	m	dm	Fr. ?
Family	5–6	oc	yrs	m	5–6	em	d	Ga.
Fanny	7–8	roc	rs	m	5–6	e	m	Pa.
Farrar (*Robinson Superb*)	7–8	------	------	m	4	e	dm	Va.
Fink	3–4	o	wyr	m	4–5	vl	m	Ohio.
Foundling	8	rov	rs	------	7–8	ml	dkm	Mass.
Fulton	6–7	o	yr	m	7–8	ml	dm	Ill.
Gano	7–8	oi	yrs	m	5–6	ml	m	Tenn ?
Garden Royal	4–5	roc	yrs	m	10	e	d	Mass.
Garfield	7–8	oc	grs	------	8–9	l	dkm	Ga.
Garrettson	5–6	rc	y	m	4	e	k	N. J.
Gideon	5–6	rc	y	a	5	e	k	Minn.
Gilbert	7–8	ob	r	------	6–7	l	km	Tenn.
Gilpin (*Little Red Romanite*)	4–5	rob	ry	ma	4–5	vl	kc	Va.
Glass Green	5–6	ov	lys	c	4	me	km	Rus.
Golden Russet (N. Y.)	4–6	ro	yru	m	5–6	vl	dm	Eng.
Golden Sweet	6–7	ro	y	s	5–6	e	dk	Conn.
Golding (*American Golden Pippin*)	6–8	roc	yr	m	5–6	m	dk	Am.
Gravenstein	8–9	oi	yr	ma	8–9	em	dkm	Ger.
Green Cheese	5–6	oi	gy	m	7–8	l	km	Tenn.
Green Newtown	5–6	ri	gr	ma	8–9	vl	dkm	N. Y.
Green Sweet	5–6	roc	gr	s	6–7	l	k	Mass.
Grimes *Golden*	5–6	roc	y	m	9–10	l	d	Va.
Haas (*Fall Queen, Gros Pomier*)	5–7	oc	gyr	m	4–6	em	km	Mo.
Hagloe	6–8	rc	gyr	------	6	e	mk	Am.
Hall	3–4	oc	r	m	6–7	ml	d	N. C.
Heslep	3–4	rc	yr	------	6–7	l	mk	Ga.
Hewes (*for cider only*)	3	r	rgy	a	2	m	c	Va.
Hibernal	5–7	obc	rs	a	3–5	m	km	Rus.
Hightop *Sweet*	4–5	r	y	s	5–6	e	d	Mass.
Hockett	5–6	ro	yrs	s	3–4	l	m	N. C.
Hoover	6–8	ro	yrs	m	5–6	l	km	S. C.
Hopewell	8	o	s	------	8	e	km	Mo.
Horn	4–5	o	yrs	m	3–4	l	m	Ga.
Horse	7–8	r	yrs	m	4–5	e	mc	N. C.
Hubbardston	7–8	rov	yrs	m	8–9	l	dm	Mass.
Hunge	8–9	ro	yrs	------	8	ml	dkc	--------
Hunt *Russet*	4–5	roc	yru	m	7–8	l	d	Mass.
Huntsman	7–8	oc	yr	m	6–7	l	dm	Mo.

APPLES—CONTINUED.

Name.	Description.							
	Size.	Form.	Color.	Flavor.	Quality	Season	Use.	Origin.
Ingram	7	o	s	------	9	e	dm	Mo.
Irish Peach	6	c	ywr	------	7-8	me	km	------
Isham *Sweet*	7-8	rob	r	------	5-6	l	km	Wis.
Jacobs Sweet	7-8	r	yr	s	7-8	l	dm	Mass.
Jefferis	5-6	oc	yrs	m	8-9	e	d	Pa.
Jersey Sweet	5-6	roc	yrs	s	8	em	dk	N. J.
Jewett *Red (Nodhead)*	5-6	ro	grs	m	6-7	l	d	N. H.
Jonathan	5-6	rc	yr	m	8-9	l	dkm	N. Y.
Judson	7-8	c	grs	------	4	me	km	Minn.
Julian	6-7	rc	wrs	------	4-6	e	d	N. C.
July, *Fourth of*	4-5	roc	wyr	m	3-4	vc	em	Ger.
Junaluskee	5-6	ro	y	m	4-6	l	d	N. C.
Kaump	6-7	r	y	------	7	l	km	Wis.
Kent *Beauty*	8-9	ro	gyr	m	3-4	m	k	Eng.
Kernodle	7-8	rob	ys	------	7-8	vl	dm	N. C.
Keswick	6-7	ci	gyr	a	5-6	em	k	Eng.
Kinnard	5-6	oci	yr	m	5-6	l	dk	Tenn.
Kirkbridge	4-5	obi	yro	m	3-4	e	km	Am.
Krauser	5-6	------	rs	------	6	vl	dk	Pa.
Lady	1-2	o	yr	m	6-7	l	dm	Fr.
Lady Sweet	7-8	rob	ygr	s	6-8	l	dk	N. Y.
Lankford	7-8	rc	grc	------	7-8	l	dm	Md.
Lansingburg	5-6	ro	yr	m	3-4	vl	m	N. Y.
Late Strawberry	5-6	rc	wrs	m	5-6	m	d	N. Y.
Lawver	7-8	ro	r	m	5-6	vl	dm	Mo.
Lehigh *Greening*	6-7	------	y	------	6-7	vl	dkm	Pa.
Lilly *of Kent*	7-8	orc	g	------	7-9	e	dm	Del.
Limbertwig	6-7	roc	gyr	m	3-6	vl	m	N. C.
Longfield	5-6	rc	y	m	4-5	e	k	Rus.
Louise, *Princess*	------	ro	we	------	5-6	l	d	Ont.
Lowe	8-9	ob	y	m	6-7	e	km	Am.
Lowell	8-9	ob	y	m	7-8	e	km	Am.
Lowland *Raspberry*	6	r	ys	m	4-5	e	km	Rus.
McAfee	7-8	ro	ygr	m	5-7	l	m	Ky.
McCuller	7-8	ro	r	------	6-7	l	dm	N. C.
McIntosh	6-7	ro	nyr	m	5-6	ml	dm	Ont.
McLellan	5-7	roc	yrs	m	5-6	m	d	Conn.
McMahon	8-9	ro	yr	m	4-5	m	dm	Wis.
Magog *Red Streak*	7-8	rob	yrs	------	7-8	l	dkm	Vt.
Maiden Blush	5-6	o	yr	m	5-6	e	km	N. J.
Malinda	6-7	rc	yr	------	5-6	vl	dkm	Vt.
Mangum (*Gulley*)	5-6	oc	yrs	m	6-8	m	d	Ala.
Mann	6-7	ro	yg	m	4-5	vl	mk	N. Y.
Margaret, *Early Red*	5-6	ro	yr	m	5-6	e	d	Eng.
Mason Stranger	5-6	o	yr	m	5-6	l	d	Va.
Maryland *Maiden Blush*	4-6	rc	yr	------	7-8	ml	mk	Md.
Mattamuskeet	5-6	roc	yr	m	3-4	l	k	N. C.
Maverack	7-8	ro	yr	s	4-6	l	mk	S. C.
Melon, *Norton*	6-7	roc	yrs	m	7-8	l	dm	N. Y.
Millboy	6-7	rc	r	------	6-7	me	d	W. Va
Milwaukee	7-8	ro	yrs	------	5-6	l	km	Wis.
Minister	7-8	oc	yrs	m	5-6	ml	dm	Mass.
Minkler	6-7	rc	gyr	m	6-8	l	m	Pa.
Missouri *Pippin*	5-6	rc	yrs	m	3-4	l	m	Mo.
Monmouth (*Red Cheek Pippin*)	7-8	oc	yr	m	6-8	l	dm	N. J.
Moore Sweet	5-6	ro	r	s	5-6	l	k	Am.
Mother	5-6	rc	yr	m	8-9	ml	d	Mass.
Munson	5-6	o	yr	s	5-6	ml	k	Mass.
Nansemond	5-6	roc	yrs	m	4-5	l	dk	Va.
Nero	5-6	ro	r	------	5-6	l	km	N. J. ?
Newell	7-8	rob	yrs	------	5-6	l	km	Wis.
Newton Spitzenburg	5-6	oc	yrs	m	7-8	l	d	N. Y.
Nickajack	8-9	oc	yrs	m	4-5	l	m	Ga.
Northern Spy	8-9	roc	yrs	m	8-9	ml	dkm	N. Y.
Northfield	5-6	ro	rys	------	6-8	me	dkm	Vt.
Northwestern *Greening*	8-9	rc	gy	m	6	l	km	Wis.
Nottingham *Brown*	8	ob	yr	------	8	l	dkm	Pa.
Noyes, *Doctor*	6-7	ro	ry	------	8	e	mdk	Am.
Oconee	8-9	ro	yr	m	4-5	m	dk	Ga.
Ogle (*Winter Snow*)	5-6	ro	r	------	7-8	vl	dkm	Ill.
Ohio Nonparcil	7-8	r	yr	m	5-6	m	dm	Ohio.

APPLES—CONTINUED.

Name.	Description.							Origin.
	Size.	Form.	Color.	Flavor.	Quality	Season	Use.	
Ohio Pippin (*Shannon*)	8-9	ro	yr	a	5-6	ml	km	Ohio.
Okabena	5	rob	rs	------	4-6	me	km	Minn.
Oldenburg, *Duchess of*	5-6	o	yrs	a	4-5	e	km	Rus.
Oliver (*Senator*)	7	------	r	------	7-8	ml	m	Ark.
Ontario	5	ob	wyr	a	6	e	m	Ont.
Ortley	7-8	rob	gyr	m	7-8	ml	dm	N. J.
Paragon	7-8	rc	yr	m	8	l	dm	Tenn.
Patten *Greening*	8-9	r	y	------	5-6	ml	km	Iowa.
Peach *of Montreal*	5-6	rc	yrs	m	5-6	l	dm	Fr.
Pease, *Walter*	8-9	rob	rys	------	7-8	me	dk	Conn.
Peck *Pleasant*	7-8	ro	yr	m	7-8	l	dkm	R. I.
Peerless	5	or	s	------	5-6	l	m	Minn.
Perfection	7-8	r	yrs	------	5-6	me	km	Iowa.
Perry Russet	5-6	rc	yru	m	5-6	ml	dk	N. Y.
Peter	7-8	r	gy	m	6-7	m	km	Minn.
Pewaukee	8-9	ro	yrs	m	4-5	l	km	Wis.
Plumb Cider	5-6	rc	yrs	m	5-6	m	dm	Wis.
Pomme Gris	3-4	ro	yrur	m	8-9	ml	d	Eur.?
Porter	7-8	obc	yr	m	8-9	em	dm	Mass.
Primate	5-6	rc	yr	m	9	e	d	N. Y.
Pryor *Red*	5-6	oi	gyr	m	7-9	l	dk	Va.
Pumpkin Sweet (*Pound Sweet*)	8-9	r	gw	s	5-6	ml	k	Conn.
Quince, *Cole*	7-8	ro	y	a	5-6	e	k	Me.
Ralls *Genet* (*Janet, Neverfail*)	5-6	oc	yrs	m	6-7	vl	m	Fr.
Rambo	5-6	o	wyr	m	7-8	m	dk	Pa.
Ramsdell *Sweet*	7-8	obc	r	s	6-7	m	km	Am.
Raspberry	3-4	obi	r	------	6-7	me	km	Rus.
Red Astrachan	7-8	rc	rgy	a	5-6	e	km	Rus.
Red Canada	5-6	oc	yr	m	8-9	l	dm	Am.
Red June, *Carolina*	3-4	ovc	rs	m	6-7	ve	dm	N. C.
Red Stripe	5-6	obc	wrs	m	5-6	e	km	Ind.
Repka Malenka	3-4	rc	rs	m	5	lm	k	Rus.
Rhode Island *Greening*	8-9	ro	gy	a	7-8	l	dkm	R. I.
Ribston	5-6	r	yr	a	7-8	l	dk	Eng.
Ridge *Pippin*	7-8	rci	yru	m	5-6	l	m	Pa.?
Rolfe (*Macomber*)	7-8	o	yrs	m	8	m	dkm	Me.
Romanite, *South*	3-4	rc	yr	m	6-7	l	d	Am.?
Roman Stem	5-6	r	wyr	m	8-9	l	dk	N. J.
Rome *Beauty*	8-9	rc	yrs	m	6-7	ml	dkm	Ohio.
Roxbury	5-6	ro	yru	m	6-7	l	km	Mass.
Russell	------	rov	yr	------	7-9	e	d	Am.
Russian Baldwin	5-6	or	grs	------	7-8	l	dkm	Rus.
Salome	5-6	rob	yr	------	7-8	vl	dkm	Ill.
Saint Johnsbury	5-6	r	yrs	s	7-8	l	dkm	Vt.
Saint Lawrence	5-6	oc	yrs	m	6-7	m	dm	Am.
Scott Winter	5	rc	rs	a	5-7	l	km	Vt.
Shiawassee	5-6	o	wrs	m	7-8	m	dkm	Mich.
Shockley	3-4	rc	yr	m	5-6	l	dm	Ga.
Smith *Cider*	6-7	roc	yrs	m	5-6	l	km	Pa.
Smokehouse	6-7	ro	yr	m	6-7	ml	k	Pa.
Sops of Wine	5-6	r	yr	m	5-6	e	d	Eur.?
Stark	8-9	robc	yrs	m	5-6	l	m	Ohio.
Starkey	7-8	ocr	ys	m	8	ml	dkm	Me.
Stayman Winesap	8-9	rc	r	------	8-9	l	mdk	Kans.
Stephenson	5-6	rob	yrs	m	5-6	l	dm	Miss.
Sterling (*American Beauty*)	8-9	rc	yr	m	7-8	l	d	Mass.
Summer King	7-8	ro	yrs	m	6-7	e	dk	N. C.
Summer Pearmain	5-6	rc	rru	m	9-10	em	d	Am.
Summer Queen	6-7	rc	yrs	a	5-6	e	km	Am.
Summer Rose	4-5	r	yrs	m	6-7	ve	d	N. J.
Sutton	6-7	roc	yrs	m	7-8	l	dm	Mass.
Swaar	7-8	ro	gy	m	7-8	l	d	N. Y.
Swazy *Pomme Gris*	2-4	ro	or	am	8-9	l	dm	Can.
Sweet Winesap	5-6	oc	r	s	6-7	l	dk	Pa.
Switzer	5-6	r	wr	m	6-7	e	k	Rus.
Taunton	7-8	oc	yrs	a	5-6	m	k	{Ala.? {Ga.?
Terry *Winter*	2-3	rc	yr	------	5-6	l	dm	Ga.
Tetofski	5-6	roc	yrs	a	4-5	e	m	Rus.
Titovka	7-8	oci	yrs	m	5-6	m	km	Rus.
Tolman *Sweet*	5-6	ro	y	s	6 7	l	km	R. I.
Tompkins King	8-9	roc	yrs	m	8-9	l	dm	N. J.

APPLES—CONCLUDED.

Name.	Description.							
	Size.	Form.	Color.	Flavor	Quality	Season	Use.	Origin.
Townsend	5-6	oc	yrs	m	6-7	l	dm	Pa.
Trenton Early	6-7	ci	yg	m	7-8	e	km	Am.
Twenty-Ounce (*Cayuga Redstreak*)	9-10	r	yrs	m	6-7	ml	km	Conn.
Utter	7-8	r	yr	------	6-7	m	dm	Am.
Vandevere	5-6	o	yrs	m	5-6	ml	km	Del.
Vanhoy	8-9	ro	yrs	------	6-7	l	dm	N. C.
Virginia Greening	8-9	o	gyr	m	5-6	l	m	Am.
Wagener	6-7	ro	yrs	m	7-8	l	dm	N. Y.
Walbridge (*Edgar Redstreak*)	5-6	oc	yrs	m	5-6	l	m	Ill.
Washington *Strawberry*	8-9	oc	yrs	m	7-8	e	dm	N. Y.
Watson *Carolina*	8-9	oc	grs	m	5-6	e	d	Am.
Wealthy	6-7	ro	yrs	m	6-7	m	dkm	Minn.
Westfield *Seek-no-further*	5-6	rc	gr	m	8-9	ml	dm	Conn.
Wetmore	5-6	r	r	------	7-8	l	dk	Tenn.
Whinery	6-7	rc	rs	------	5-6	l	km	Ohio.
White Juneating (*Yellow May*)	4-5	r	yr	------	6-7	e	d	--------
White Pearmain (*W. W. Pearmain*)	5-6	robc	yr	m	8-9	l	dm	Am.
White Pigeon	5-6	rc	ruy	s	6-7	me	dk	Rus.
White Pippin	7-8	ro	wyr	m	8-9	l	dm	Am.
Williams *Favorite*	5-6	robc	r	m	6-7	e	dm	Mass.
Willow *Twig*	6-7	roc	yr	m	5-6	vl	m	Va. ?
Windsor	5-6	r	yr	m	6	ml	m	Wis.
Wine *Hays*	7-8	ro	yr	m	6-7	l	dm	Del
Winesap	5-6	rob	yr	a	7-8	vl	dkm	N. J.
Winter St. Lawrence	5-6	r	rs	------	7-8	l	d	Eng.
Wistal	7-8	r	y	------	7-8	me	km	Tex.
Wolf River	9-10	ro	wrs	m	5-6	m	km	Wis.
Wythe	5-6	oc	wrs	m	5-6	l	dk	Ill.
Yates	2-3	oc	yrs	m	5-6	vl	m	Ga.
Yellow Bellflower	8-9	obc	yr	a	8-9	l	dkm	N. J.
Yellow June	3-4	ro	y	a	5-6	e	dk	Am.
Yellow Newtown (*Albemarle*)	7-8	ro	yr	a	9-10	vl	dkm	N. Y.
Yellow Transparent	6-7	rc	wy	a	5-6	e	km	Rus.
Yopp	8-9	rc	gyr	m	5-6	m	dk	Ga.
York Imperial (*Johnson's Fine Winter*)	7-8	oi	yrs	m	6-7	l	dm	Pa.

BLACKBERRIES AND DEWBERRIES. (Rubus.)

BLACKBERRIES (*R. VILLOSUS.*)

[KEY.—Size, scale 1 to 10; 1, very small; 10, very large. Form: c, conical; o, oblong; ov, oval; r, round. Color: b, black. Quality, scale 1 to 10; 1, very poor; 10, best. Season: e, early; m, medium; l, late; v, very. Use: d, dessert; k, kitchen; m, market. Abbreviations of names of places of origin: Am., America.]

Name.	Description.						
	Size.	Form.	Color.	Quality	Season	Use.	Origin.
Agawam	7-8	ro	b	8-9	e	dm	Am.
Allen	7-8	oc	b	9-10	ve	dm	Pa.
Briton, *Ancient*	5-6	oov	b	5	m	m	Wis.
Brunton	5-6	o	b	9-10	e	dm	Am.
Crandall	------	------	------	------	ve	------	Tex. ?
Dallas	7-8	------	b	7-8	m	dkm	Tex.
Early Harvest	4-5	ro	b	7-8	e	dm	Ill.
Eldorado	7-9	o	b	7-9	e	dkm	Ohio.
Erie	8-9	rov	b	5	m	m	Pa.
Kittatinny	7-9	ro	b	7-8	ml	d	N. J.
Lawton	8-9	ov	b	7-8	m	m	N. Y.
Minnewaska	9	ov	b	6	m	dm	N. Y.
Robison	7-8	ro	b	7-8	em	km	Tex.
Snyder	6-7	o	b	7-8	ml	dm	Ind.
Stone	5	ro	b	7-8	l	d	Wis.
Taylor	6-7	ro	b	7-8	l	d	Ind.
Triumph, *Western*	5-6	oov	b	6	l	d	Am.
Wachusett	.5	oov	b	7	e	d	Mass.
Wilson	8-9	oov	b	7-8	m	m	N. J.

DEWBERRIES. (*R. CANADENSIS.*)

Name.	Description.						
	Size.	Form.	Color.	Quality	Season	Use.	Origin.
Lucretia	9-10	oov	b	6	e	dk	W. Va
Mayes (*Austin*)	9-10	cov	b	5-6	ve	dm	Tex.

CHERRIES (Cerasus.)

HEARTS AND BIGARREAUS. (*C. AVIUM.*)

[KEY.—Size, scale 1 to 10: 1, very small; 10, very large. Form: c, compressed; h, heart shaped; o, oblate; r, round. Color: a, amber; b, black; p, purple; r, red; y, yellow. Quality, scale, 1 to 10: 1, very poor; 10, best. Season: e, early; m, medium; l, late; v, very. Use: d, dessert; k, kitchen; m, market. Abbreviations of names of places of origin: Am., America; Eng., England; Eur., Europe; Fr., France; Ger., Germany; Ont., Ontario; Rus., Russia.]

Name.	Description.						
	Size.	Form.	Color.	Quality	Season	Use.	Origin.
Bing	7-8	———	b	8-9	l	dm	Oreg.
Black Heart	6-7	hc	b	5-7	ve	dm	Eur. ?
Centennial	9-10	oh	yr	8-9	———	dm	Cal.
Coe *Transparent*	5-6	r	yr	10	e	d	Conn.
Downer	5-6	rh	r	8-9	m	dm	Mass.
Eagle, *Black*	6-7	oh	b	6-7	m	dm	Eng.
Early Purple *Guigne*	3-4	rh	pb	6-7	ve	d	(?)
Elkhorn	8-9	h	b	7-8	l	dm	———
Elton	8-9	h	yr	9	e	dm	Eng.
Hoskins	9-10	rh	pr	7-8	lm	dm	Oreg.
Knight *Early*	8-9	oh	b	7-8	e	d	Eng.
Lambert	9-10	h	pr	8-9	ml	dm	Oreg.
Lewelling	8-9	rh	b	8-9	———	dm	Oreg.
Mezel	9-10	oh	rb	7-8	m	d	Eur.
Napoleon (*Royal Ann*)	8-9	h	yr	5-6	m	m	Eur.
Oxheart	7-8	oh	r	5-6	m	dm	———
Republican, *Black*	8-9	———	b	———	vl	dm	Oreg.
Rockport	8-9	oh	ra	8-9	m	dm	Ohio.
Spanish, *Yellow*	9-10	oh	yr	9-10	em	d	Eur.
Tartarian, *Black*	9-10	h	b	9-10	em	dm	Rus.
Windsor	8	h	yr	7-8	l	dm	Ont.
Wood, *Governor*	7-8	rh	yr	7-8	em	dm	Ohio.

NECTARINES AND PEACHES. (Persica vulgaris.)

NECTARINES. (*P. VULGARIS var. LÆVIS.*)

[KEY.—Size, scale 1 to 10: 1, very small; 10, very large. Form: c, compressed; o, oblate; ov, oval; r, round. Color: c, creamy; g, green; r, red; w, white; y, yellow. Adhesion: c, cling; f, free; s, semicling. Quality, scale 1 to 10; 1, very poor; 10, best; Season, e, early; m, medium; l, late; v, very. Use: d, desert; k, kitchen; m, market. Abbreviations of names of places of origin: Am., America; Belg., Belgium; Eng., England; Eur., Europe; Fr., France.]

Name.	Description.								
	Size.	Form	Color. Skin.	Color. Flesh.	Adhesion.	Quality	Season	Use.	Origin.
Boston	7-8	rov	yr	y	f	5-6	m	d	Mass.
Downton	7-8	rov	gr	gr	f	5-6	ve	d	Eng.
Early Newington	7-8	rov	gr	gwr	c	9-10	e	d	Eng.
Early Violet	7-8	r	yr	wr	f	7-8	ve	d	Fr.
Elruge	5-6	rov	gr	g	f	7-8	l	d	Eng.
New White	6-7	r	w	w	f	6-7	------	dm	------
Stanwick	6-7	rov	gr	w	f	4-5	l	d	Eng.

PEACHES. (*P. VULGARIS.*)[1]

Albright	7-8	r	w	------	c	7	l	dm	N. C.
Alexander	5-6	r	wr	cw	s	5-6	ve	dm	Ill.
Allen *October*	7-8	r	yr	yr	f	5	l	dm	Mo.
Amelia	7-8	r	wr	w	f	7-8	e	dm	N. C.
Ameliaberta	6	------	y	y	f	------	------	------	Ga.
Angel	7-8	r	wr	gw	f	7-8	e	dm	Fla.
Banner	------	------	------	------	------	------	------	------	------
Beers Smock	7-8	ov	yr	yr	f	5-6	l	km	N. J.
Bequett Cling	7-8	roi	gwr	------	c	6-7	me	mk	Tex.
Bequett Free	7-8	roi	gwr	------	f	6-7	me	m	Tex.
Bergen *Yellow*	8-9	r	yr	y	f	8-9	m	d	Am.
Bidwell Early	4-5	ov	wr	gw	c	5-6	ve	dk	Fla.
Bidwell Late	5-6	ov	wr	gw	c	7-8	l	dk	Fla.
Bilyeu	7-8	r	gw	w	f	6-7	vl	dkm	Md.
Bishop *Early*	7	r	w	------	f	8	ml	m	Cal.
Blood Cling	8-9	rov	y	yr	c	5-6	vl	k	Am.
Blood Free	8-9	rov	y	yr	f	5-6	vl	k	Am.
Brandywine	8-9	roi	ygr	------	f	6	me	m	Del.
Brigdon (*Garfield*)	5-6	rov	yr	yr	f	7-8	m	dm	N. Y.
Cabler *Indian*	8-9	r	r	r	c	4-5	m	k	Tex.
Chairs *Choice*	7-8	r	yr	yr	f	6-7	m	km	Md.
Champion	7-8	r	cr	w	f	7-8	em	dm	Ill.
Chili, *Hills*	5-6	ovc	yr	yr	f	5-6	me	m	N. Y.
Chinese Cling	9-10	rc	cwr	wr	c	7-8	m	km	Am.
Columbia	7-8	r	w	y	f	5-6	ml	m	Ga.
Connett *Southern Early*	8	ob	w	------	s	7-8	m	m	N. C.
Cox Cling	7-8	r	gw	g	c	7-8	------	dm	Tex.
Crosby	6-7	r	yr	y	f	7-8	m	m	Mass.
Curtis	------	------	------	------	------	------	------	------	------
Early Barnard	5-6	r	yr	y	f	6-7	m	m	Ill.
Early China	5-6	ov	w	w	f	7-8	ve	dm	Tex.
Early Crawford	8-9	rov	yr	y	f	8-9	m	dm	N. J.
Early Toledo	7-8	r	wr	w	f	7-8	e	dm	Ohio.
Early York	5-6	rov	wr	w	f	8-9	e	dm	Eng.
Eaton	6-7	r	yr	y	c	5-6	m	dm	N. C.
Elberta	8-9	rc	yr	y	f	7-8	ml	m	Ga.
Emma	8-9	rc	yr	------	f	8-9	ml	m	Ga.
Family Favorite	7-8	ro	gw	g	s	7-8	e	dm	Tex.
Fitzgerald	7-8	ov	ry	yr	f	8-9	me	dm	Can.
Forrester	8-9	r	yr	------	------	8-9	m	dm	Ga.
Foster	9-10	r	yr	y	f	9-10	m	dm	Mass.
Fox *Seedling*	7	r	w	cw	f	7-8	l	m	N. J.
Galveston	4-5	ro	yg	yg	c	6-7	l	d	Tex.
Georgia, *Belle of*	7	rob	wr	w	f	7-8	e	km	Ga.
Globe	8-9	rov	yr	y	f	7-8	m	m	Pa.
Golden Cling	8-9	ovc	yr	y	c	7-8	l	km	Cal.
Greensboro	7-8	r	r	w	s	7-8	e	m	N. C.

PEACHES—CONCLUDED.

Name.	Description.									
	Size.	Form.	Color.		Adhesion.	Quality	Season	Use.	Origin.
			Skin.	Flesh.					
Hale	4-5	r	gwr	gw	s	5-6	e	m	Ohio.
Heath Cling	8-9	rov	wr	w	c	9-10	vl	km	Md.
Henrietta	6-7	ro	yr	yr	c	6-8	l	mk	D. C.
Honey	4-5	ov	cr	wr	f	8-9	----	dk	N. Y.
Hynes *Surprise*	4-5	r	r	cr	s	7	l	dm	Ky.
Ingold, *Lady*	6-7	r	yr	yr	f	8	me	dm	N. C.
Kalamazoo	7-8	ov	ry	yr	f	8-9	me	dkm	Mich.
Kerr, *Jessie*	7-8	ov	wr	w	f	5-6	ve	m	Md.
Keyport	7-8	rov	wr	w	f	4-5	l	m	Am.
Large York	6-7	r	wr	w	f	7-8	e	dm	Eng.
Late Admirable	8-9	rov	gr	w	f	8-9	m	d	Fr.
Late Crawford	8-9	r	yr	y	f	8-9	l	dm	N. J.
Late Rareripe	7-8	rov	yr	w	f	8-9	m	dm	Am.
Lee, *General*	8-9	ro	g	g	c	8	e	m	Am.
Lemon Cling	8-9	rov	yr	y	c	8-9	m	dm	S. C.
Lemon Free	8-9	ob	y	y	f	8-9	l	dm	Ohio.
Lewis	6-7	r	rw	cr	f	7-8	l	dkm	Mich.
Louise	5-6	r	r	w	f	7-8	e	dm	Eng.
Lolo, *Miss*	6-7	r	rw	cr	f	8	e	dm	Tex.
Lovell	5-6	re	yr	y	f	7-8	l	km	Cal.
Mamie Ross	6-8	ro	w	y	c	7-8	e	dm	Tex.
Mary *Choice*	8-9	r	yr	yr	f	8-9	l	m	Md.
Morris White	7-8	ov	cw	w	f	5-6	m	km	Am.
Mountain Rose	6-7	r	wr	w	f	8-9	em	dm	N. J.
Muir	8-9	w	y	y	f	8-9	m	dkm	Cal.
McDevitt	8-9	obc	yr	yr	c	7-8	m	km	Cal.
Oldmixon Cling	7-8	rov	c	w	c	7-8	m	km	Am.
Oldmixon Free	7-8	rov	c	w	f	8-9	m	dm	Am
Onderdonk	7-8	ov	w	w	f	7-8	m	dm	Tex.
Orange Cling	7-8	r	y	y	c	5-6	m	km	----
Pallas	7-8	ov	w	w	f	6-7	e	dm	Ga.
Parham	5-6	r	yw	wr	f	5-6	l	mk	Am.
Peen to	4-5	f	w	w	c	7-8	e	d	Ga.
Peninsula	8	o	y	y	f	7-8	ml	m	Md.
Phillips Cling	7-8	oc	y	y	c	7-8	ml	dm	Cal.
Picquet	7-8	r	yr	y	f	5-6	l	d	Ga.
Prize	7	ob	y	yr	f	8	l	m	----
Red Cheek *Melocoton*	7-8	rov	yr	y	f	6-7	m	dm	Am.
Reeves' Favorite	8-9	rov	yr	y	f	7-8	m	m	N. J.
Richmond	8-9	r	yr	y	f	6-7	m	m	N. J.
Rivers	6-7	re	cw	w	f	7-8	e	dm	Eng.
Royal George	5-6	r	wr	w	f	10	m	d	Eur.
Russell	7-8	r	wr	w	f	7-8	e	dkm	Nebr.
Salway	7-8	rov	yr	y	f	5-6	l	m	Eng.
Smock	7 8	ov	yr	y	f	5-6	l	m	N. J.
Sneed	6-7	ov	gw	w	c	4-5	ve	m	Tenn.
Snow	7-8	r	w	w	f	6-7	m	dm	Am.
Stevens *Rareripe*	6-7	rov	cw	w	f	7-8	ml	m	N. J.
St. John	7-8	r	yr	y	f	7-8	e	m	Am.
Stonewall *Jackson*	7-8	ro	gy	g	c	6-7	e	km	Tex.
Strawberry	5-6	ov	r	w	f	7-8	em	dm	N. J.
Stump	8-9	rov	wr	w	f	6-7	ml	m	N. Y.
Susquehanna	9-10	r	yr	y	f	9-10	m	dk	Pa.
Texas	4-5	ro	yg	g	sc	5-6	l	d	Tex.
Thurber	6-7	rov	wr	w	f	7-8	e	d	Ga.
Tillotson	5-6	r	wr	w	f	7-8	e	d	N. Y.
Tippecanoe	8-9	r	yr	y	c	6-7	l	dm	Pa.
Triumph	5-6	r	yr	yr	s	8-9	e	dm	Ga.
Troth	3-4	r	wgr	wr	f	5	me	m	N. J.
Tuskena	8-9	oc	y	yr	c	7-8	e	dkm	South
Wager	5-6	ov	y	y	f	4-5	m	m	N. Y.
Waldo	4-5	ov	w	w	f	6-7	e	dm	Fla.
Walker *Var. Free*	8	o	wr	wr	f	7-8	l	dm	Del.
Ward *Late*	7-8	rov	wr	w	f	7-8	vl	dk	Am.
Waterloo	5-6	r	wr	gw	s	5-6	ve	dm	N. Y.
Wheatland	9-10	r	yr	y	f	6-7	m	dm	N. Y.
Yellow Rareripe	7-8	r	yr	y	f	7-8	m	dm	Am.

[1] The distinctive peculiarities of the families or strains of peaches known as Chinese, Persian, and Spanish being more or less ill-defined and obscured by crossing or hybridization, a correct classification of varieties under these heads is not deemed practicable.

PEARS. (Pyrus communis and sinensis.)

[Key.—Size, scale 1 to 10: 1, very small; 10, very large. Form: i, irregular; o, oblate; ob, oblong; obo, obovate; obt, obtuse; ov, ovate; p, pyriform; r, round; t, turbinate. Color: b, brown; c, crimson; g, green; r, red; ru, russet; y, yellow. Texture: b, buttery; f, firm; g, granular; m, melting; t, tender. Flavor: a, acid; as, astringent; j, juicy; s, sweet; v, vinus; p, perfumed. Quality, scale 1 to 10: 1, very poor; 10, best. Season: e, early; m, medium; l, late; v, very. Use: d, dessert; k, kitchen; m, market. Abbreviations of names of places of origin: Am., America; Belg., Belgium; Eng., England; Eur., Europe; Flem., Flemish Provinces; Fr. France; Hol., Holland.]

Name.	*Description.*								
	Size.	*Form.*	*Color.*	*Texture.*	*Flavor.*	*Quality*	*Season*	*Use.*	*Origin.*
Alamo				bm					Tex.
Ananas *d'Etc*	6-7	p	ybru	bm	sp	5-6	em	d	Hol.
Andrews	6-7	pi	gyr	m	v	4-5	e	d	Mass.
Angouleme, *Duchess de*	9-10	obobo	gyru	b	v	5-9	m	dm	Fr.
Anjou	7-8	obtp	gre	m	vp	8-9	m	dm	Fr.
Ansault	4-5	rob	gyru	m	sv	4-5	e	m	Fr.
Archangel	8-9	obop	yru	bm	jp	4-5	m	m	Fr.
Bartlett	7-8	oboptp	yrur	bt	jop	6-8	em	dm	Eng.
Bessemianka	5-6	oobo	y	g	js	4-5	e	m	Rus.
Bloodgood	4-5	topo	yru	bm	sp	6-7	e	d	N.Y.?
Bordeaux, *Duchess de*	5-6	rop	yru	t	js	6-7	l	m	Fr.
Bose	8-9	p	yrur	mb	p	8-9	m	dm	Belg.
Boussock	7-8	obop	yru	bm	jp	6-8	m	m	Belg.
Brandywine	5-6	p	ygru	m	jop	6-7	e	m	Pa.
Buffum	5-6	obobo	yr	b	sv	6-7	m	km	R. I.
Chambers	4-5	robo	yr	gf	s	4-5	ve	d	Md.?
Clairgeau	7-8	p	yc	bg	jsp	4-5	l	m	Fr.
Clapp *Favorite*	7-8	obop	yc	bm	jsv	5-6	em	m	Mass.
Columbia	8-9	obo	y	m	jsp	6-7	l	m	N.Y.
Comice, *Doyenne du*	8-9	rp	yc	mb	jsp	8-9	ml	dm	Fr.
Danas Hovey	3-4	obop	yru	m	jsp	9-10	l	d	Mass.
Diel	8-9	obop	yru	gb	sv	5-6	m	d	Belg.
Drouard, *President*	8	ovi	gy	t	sp	5-6	l	m	Fr.
Easter *Beurre*	7-8	robo	ygru	bm	js	5-6	vl	d	Eur.
Elizabeth *Manning's*	4-5	obop	yr	m	jsp	6-7	e	d	Belg.
Flemish *Beauty*	8-9	obobt	yrur	m	jsp	6-7	em	dm	Belg.
Frederick Clapp	6-7	rp	y	m	jvp	5-6	m	dm	Mass.
Garber	7-8	robtp	yr	fg	ja	3-4	ml	km	Pa.
Ghislain	5-6	p	y	b	jrich	4-5	m	d	Belg.
Giffard	5-6	p	gyr	m	jvp	7-8	e	dm	Fr.
Glout Moreeau	6-7	obop	gyb	bm	srich	6-9	l	d	Flem.
Goodale	7-8	obp	yeru	mg	svp	5-6	m	dm	Me.
Gran Isle	5	c	gy	m	s	7	me	dm	Vt.
Gray Doyenne	5-6	ovobo	ru	bm	rich	8-9	m	d	Fr.
Hardy *Beurre*	7-8	obop	grur	bm	jv	6-8	m	m	Eur.?
Heyst, *Emile de*	8-9	obp	yru	m	svp	8-9	ml	d	Belg.
Howell	6-7	rp	vr	m	jv	5-6	m	dm	Conn.
Idaho	8-9	obot	yru	m	sv	8-9	m	dm	Idaho
Kieffer	7-9	rov	yru	gm	js	3-5	ml	mk	Pa.
Kirtland	4-5	obtobo	yrru	m	jsp	7-8	e	d	Ohio
Langelier	5-6	obop	yeru	mg	v	3-4	l	d	Eng.
Lawrence	5-6	obop	yru	m	sp	7-8	l	dm	N.Y.
Le Conte	7-8	robtp	yr	m	s	3-4	m	m	Am.
Lawson	6-7	obo	yr	fg	s	3-4	e	m	N.Y.
Lincoln	6-7	obop	yr	bm	s	7-8	m	dm	Ill.
Louise *Bonne de Jersey*	6-7	obp	gbr	m	j	5-6	m	dm	Fr.
Lucrative *Belle*	5-6	obop	ygru	m	s	7-9	m	dm	Flem.
McLaughlin	7-8	obtp	gyru	m	jvp	4-5	l	dk	Me.
Madeline	4-5	obop	ygb	m	sp	6-7	e	d	Fr.
Magnolia	7-8	obgr	ru	m		5	e	mk	Ga.
Malines, *Josephine de*	5-6	rop	gyru	m	jsp	7-8	l	dm	Belg.
Marguerite, *Petite*	4-5	obtp	yb	bm	jsp	5-6	e	d	Fr.
Marie Louise	6-7	obp	gyru	bm	jvas	5-6	ml	dk	Belg.
Merriam	5-6	ro	yru	gm	jvp	4-5	m	dm	Mass.
Mount Vernon	6-7	obtp	yrur	gm	jvp	5-6	ml	dm	Mass.
Napoleon	6-7	obtp	gy	m	js	5-6	ml	km	Belg.
Onondaga (*Swan's Orange*)	8-9	obtp	yru	bmg	jv	6-7	ml	km	Conn.
Osband *Summer*	3-4	obop	y	m	jsp	5-6	ve	dm	N.Y.
Ott	3-4	robo	gyrur	m	sp	4-5	e	dm	Pa.
Paradise *d'Antomne*	7-8	obp	yru	gm	jvp	5-6	m	dk	Belg.
Pound	8-9	p	ygb	fg	v	2-3	vl	k	Eur.

PEARS—CONTINUED.

Name.	Description.								
	Size.	Form.	Color.	Text. ure.	Flavor.	Quality	Season	Use.	Origin.
Rostiezer	3-4	obop	yrb	mb	svp	8-9	e	d	Eur.
Rutter	6-7	rp	gyru	gm	sv	5-6	ml	dm	Pa.
Secke	3-4	obo	bgrur	bm	jp	9-10	ml	d	Pa.
Sheldon	6-8	robo	gyrub	m	jsvp	7-8	ml	dm	N. Y.
Smith	7-8	rov	ry	t	vas	3-4	m	km	South
Souvenir *du Congress*	7-9	obobl p	yr	bt	jvp	5-6	em	m	Fr.
Sterling	5-6	rop	yruc	m	js	4-5	e	dm	N. Y.
Stevens	7-8	r	y	b	sp	4-5	e	d	N. Y.
Summer Doyenne (*Doyenne d Ete*)	2-3	robo	yr	m	js	6-7	ve	d	Belg.
Superfine	6-7	rp	yeru	bm	v	6-7	m	km	Fr.
Tyson	4-5	p	yruc	m	jsp	8-9	m	dm	Pa.
Urbaniste	5-6	obop	yru	bm	jp	7-8	ml	dm	Belg.
Vermont *Beauty*	4-5	obob	yru	t	s	8-9	l	dm	Vt.
Vicar *of Winkfield*	7-8	p	yb	b	js	4-5	l	km	Fr.
Washington	5-6	ovobo	yr	m	js	5-6	e	d	Del.
White Doyenne	5-6	obo	yr	bm	jsv	8-10	ml	dm	Fr.
Wilder Early	4-5	obobbr	yr	t	sv	7-8	e	dm	N. Y.
Winter Nelis	5-6	robo	ygru	bm	jsp	8-9	l	dm	Belg.

PLUMS. (Prunus.)

(*P. AMERICANA.*)

[KEY.—Size, scale 1 to 10; 1, very small; 10, very large. Form: c, compressed; f, flattened; o, oval; ob, obovate; obl, oblong; r, round. Color: b, black; br, brown; g, green; p, purple; r, red; v, violet; w, white; y, yellow. Quality, scale, 1 to 10; 1, very poor; 10, best. Season: e, early; m, medium; l, late; v, very. Use: d, dessert; k, kitchen; m, market; c, curing. Abbreviations of names of places of origin: Am., America; Belg., Belgium; Eng., England; Eur., Europe; Fr., France; Ger., Germany; Jap., Japan; Ont., Ontario; Rus., Russia.

Name.	Description.						
	Size.	Form.	Color.	Quality	Season	Use.	Origin.
Aitkin	8	o	r	6	me	dkm	Minn.
American *Eagle*	6-7	ro	r	5	me	m	Mo.
Black Hawk	8	ro	r	8	ml	dkm	Iowa.
Comfort	8	r	r	5	l	dkm	Iowa.
Cottrell	8	ro	ry	7	me	km	Minn.
De Soto	5-6	ro	yr	5-6	m	km	Wis.
Forest Garden	5-6	r	r	5	em	k	Iowa.
Gaylord	8	ro	ry	7	l	dk	Iowa.
Hawkeye	5-6	r	r	6-7	ml	km	Iowa.
Louisa	6	ro	r	5	ml	m	Mo.
New Ulm	9-10	ro	yr	7	l	dk	Minn.
Ocheeda	6	ro	ry	8	ml	dk	Minn.
Piper	7	r	r	8	l	dk	Minn.
Quaker	8	ro	ry	8	e	dk	?
Rockford	5-6	ro	yr	8-9	m	d	Iowa.
Rollingstone	6-7	ro	r	6-7	m	dk	Minn.
Stoddard	8-9	r	r	5	me	m	Iowa.
Surprise	7-8	o	dr	9-10	m	dm	Minn.
Weaver	5-6	oc	r	5-6	m	km	Iowa.
Wolf	6-7	ro	r	6-7	m	km	Iowa.
Wyant	4-5	ro	yr	5-6	m	k	Iowa.

PLUMS.—*P. ANGUSTIFOLIA.*

Name.	Description.						
	Size.	Form.	Color.	Quality	Season	Use.	Origin.
Caddo Chief	5-6	o	r	6	ve	dm	La.
Cluck	5	ro	r	5	me	m	Tex.
Lone Star	2-3	o	r	3	m	k	Tex.
Munson	5	ro	r	5	me	m	Tex.
Newman	5-6	o	r	3-4	m	km	Ky.
Pottawattamie	5-6	r	r	3-4	ml	km	Tenn.
Texas Belle (*Paris Belle*)	5-6	r	r	------	m	------	Tex.
Yellow Transparent	7-8	o	y	5-6	e	km	Tex.
P. CERASIFERA.[1]							
De Caradeuc	5-6	r	dr	3-4	e	k	S. C.
Marianna	5-6	r	r	2-4	l	km	Tex.

[1] Includes supposed hybrids.

THE SOCIETY'S RULES FOR EXHIBITING AND NAMING FRUITS.

The rules of the American Pomological Society for exhibiting and naming fruits are as follows:

SECTION I.

NAMING AND DESCRIBING NEW FRUITS.

Rule 1.—The originator or introducer (in the order named) has the prior right to bestow a name upon a new or unnamed fruit.

Rule 2.—The society reserves the right, in case of long, inappropriate, or otherwise objectionable names to shorten, modify, or wholly change the same, when they shall occur in its discussions or reports; and also to recommend such changes for general adoption.

Rule 3.—The name of a fruit should preferably express, as far as practicable by a single word, a characteristic of the variety, the name of the originator, or the place of its origin. Under no ordinary circumstances should more than a single word be employed.

Rule 4.—Should the question of priority arise between different names for the same variety of fruit, other circumstances being equal, the name first publicly bestowed will be given precedence.

Rule 5.—To entitle a new fruit to the award or commendation of the society it must possess (at least for the locality for which it is recommended) some valuable or desirable quality, or combination of qualities, in a higher degree than any previously known variety of its class and season.

Rule 6.—A variety of fruit having been once exhibited, examined, and reported upon as a new fruit by a committee of the society will not thereafter be recognized as such, so far as subsequent reports are concerned.

SECTION II.

COMPETITIVE EXHIBITS OF FRUITS.

Rule 1.—A plate of fruit must contain six specimens, no more, no less, except in the case of single varieties not included in collections.

Rule 2.—To insure examination by the proper committees all fruits must be correctly and distinctly labeled and placed upon the tables during the first day of the exhibition.

Rule 3.—The duplication of varieties in a collection will not be permitted.

Rule 4.—In all cases of fruits intended to be examined and reported by committees the name of the exhibitor, together with a complete list of the varieties exhibited by him, must be delivered to the secretary of the society on or before the first day of the exhibition.

Rule 5.—The exhibitor will receive from the secretary an entry card, which must be placed with the exhibit, when arranged for exhibition, for the guidance of committees.

Rule 6.—All articles placed upon the tables for exhibition must remain in charge of the society till the close of the exhibition, to be removed sooner only upon express permission of the person or persons in charge.

Rule 7.—Fruits or other articles intended for testing, or to be given away to visitors, spectators, or others, will be assigned a separate hall, room, or tent, in which they may be dispensed, at the pleasure of the exhibitor, who will not, however, be permitted to sell and deliver articles therein, nor to call attention to them in a boisterous or disorderly manner.

SECTION III.

COMMITTEE ON NOMENCLATURE.

Rule 1.—It shall be the duty of the president, at the first session of the society, on the first day of an exhibition of fruits, to appoint a committee of five expert pomologists whose duty it shall be to supervise the nomenclature of the fruits on exhibition, and in case of error to correct the same.

Rule 2.—In making the necessary corrections they shall, for the convenience of the examining and awarding committees, do the same at as early a period as practicable, and in making such corrections they shall use cards readily distinguishable from those used as labels by exhibitors, appending a mark of doubtfulness in case of uncertainty.

SECTION IV.

EXAMINING AND AWARDING COMMITTEES.

Rule 1.—In estimating the comparative values of collections of fruits committees are instructed to base such estimates strictly upon the varieties in such collections which shall have been correctly named by the exhibitor prior to action thereon by the committee on nomenclature.

Rule 2.—In instituting such comparison of values committees are instructed to consider: First, the values of the varieties for the purposes to which they may be adapted; second, the color, size, and evenness of the specimens; third, their freedom from the marks of insects, and other blemishes; fourth, the apparent carefulness in handling, and the taste displayed in the arrangement of the exhibit.

THE CODLING MOTH AND LATE SPRAYING IN OREGON.

By Prof. A. B. Cordley.

Wonderful stories of the codling moth are told "where rolls the Oregon." From the dealer in real estate and from the optomist who depicts the advantages of his particular region in the most glowing terms, comes the story of an apple grower's paradise where neither moth nor rust doth corrupt. From the horticulturist, who by the sweat of his brow has brought forth a bearing orchard only to see the golden and crimson fruits of his labor become the noisome habitations of disgusting caterpillars, comes lamentations like unto those of the prophet Joel: "That which the palmer-worm hath left hath the locust eaten; and that which the locust hath left hath the canker-worm eaten; and that which the canker-worm hath left hath the caterpillar eaten." Seen through the blue spectacles of his experience, nowhere else is the codling moth so destructive as in his own orchard or locality.

From the entomologist comes stories of the wonderful powers of reproduction exhibited by an insect, which, in other apple growing regions develops but one or two broods a year, yet, under the revivifying influence of an unknown something in our climatic, geographical or geological conditions, multiplies even unto the third and fourth generation in a single season.

Is it not possible that there is a happy middle ground of truth for all these stories? Is it not possible that we have all been mistaken? Is it not possible that even in the land of the real estate dealer and the optomist an occasional codling moth may be found? Is it not possible that other horticulturists in other regions have likewise had equal cause with us to echo the lamentations of Joel? Is it not possible that even the entomologist has been mistaken and that here as in less favored regions, the codling moth has refused to be stampeded by the wonderful prospects of new worlds to conquer and still goes on the even tenor of its way producing but two broods annually? Is it not time that we call a halt until the grounds on which these claims have been made can be thoroughly reconnoitered, that we may not be unduly elated by false hopes nor unduly discouraged by imaginary difficulties?

ARE THERE IMMUNE REGIONS?

It is undoubtedly true that there are small apple growing sections scattered here and there throughout the entire Pacific Northwest that are still free, or practically free, from the codling moth. But does this necessarily imply that they are to remain free? Does it necessarily imply that

the climatic or other natural conditions are such that the moth cannot thrive there? May not the present immunity be accounted for on other grounds? During the past six years it has been my privilege to visit several of these favored sections and to note the conditions, both by observation and by conversation with resident fruit growers. Six or seven years ago Hood River, probably the most famous apple growing region in the state, was said to be practically free from this pest. Its presence in small numbers was admitted by little damage had been done and little fear was felt for the future. The cold evening breezes that come down from the mountains were said to prevent the moths from depositing their eggs. Today the mist from the spray pumps as it floats over the orchards of that region demonstrates alike the progressive nature of the fruit growers and the error of their former belief.

There are still scattered here and there throughout the eastern part of our state, communities that indulge in this same hope of immunity from the codling moth and for the same reason. It is seriously to be doubted whether their expectations have a firmer foundation of facts than existed at Hood River.

West of the Coast range of mountains there are other communities which also indulge in this same hope of immunity but for other reasons. There, it is not the cold breezes which come down from the mountains—the breezes do not come that way—but the moisture, the temperature, the "salt" or some other unknown feature of the ocean winds which kiss the orchards of those regions, that is supposed to carry death and destruction to the codling moth and joy to the hearts of the apple growers.

During the last few days of August and the first of September, 1899, I took a hurried trip through portions of Coos county, Oregon, for the special purpose of demonstrating, to my own satisfaction, the presence or absence of the codling moth and in case of its absence to investigate so far as the time at my command permitted, the conditions under which this immunity existed.

Leaving the railroad at Drain I went by wheel to Scottsburg, the head of navigation on the Umpqua, a distance of some twenty-five or thirty miles. Apple orchards along the route were visited and in every one the codling moth was present. One grower, within a few miles of Scottsburg, told me that it had been in his orchard about six or eight years. From Scottsburg to Gardiner, I went by boat and no orchards were visited. Indeed if any exist they are probably moth free since they are separated from each other by considerable distances and completely shut off from intercourse with the outside world except by boat. From Winchester, across the bay from Gardiner, to Coos Bay, the road leads along the beach and no orchards are present. In the immediate vicinity of Empire and Marshfield, the principal cities of the Coos Bay region, and the points at which the moth would the most likely be introduced in imported fruit, no orchards were seen. Across the bay from Marshfield I visited the orchards of Mr. Anton Wirth and Mr. McIntosh. In neither of these orchards was there to be found any evidence of the codling moth and Mr. Wirth in-

formed me that it had never been seen there. The McIntosh orchard is an old one and showed evidence of neglect, conditions favorable to the development of the moth had it ever been introduced. Mr. Wirth, who has been a deputy fruit inspector of that region, did not know of any codling moth in that immediate vicinity but had heard that it is present in some orchards about the headwaters of Coos river, presumably along the Roseburg and Coos Bay stage route, as that would correspond with the conditions I found on going out by way of the Myrtle Point-Roseburg route. From Marshfield to Myrtle Point, several orchards were noted along the line of the railroad but none were visited. At Myrtle Point I spent one day in examining orchards but found no wormy apples. Mr. T. F. Perkins, a nurseryman of Parkersburg, who has canvassed the county thoroughly each year, told me that the codling moth has appeared at a certain ranch on the Fishtrap between Coquille and Myrtle Point, in the North Carolina settlement on the headwaters of the South Fork and in an orchard on Big Creek near Bridge P. O. Mr. A. H. Black, a merchant who handles a large amount of fruit, reported that "wormy" apples are very scarce, but that a few had been found in the fruit from one orchard near Myrtle Point and one near Norway. One of these orchards was visited later but no codling moth could be found and the owner assured me that he had never seen a wormy apple in his orchard. Near Big Creek, about ten or twelve miles out from Myrtle Point on the road to Roseburg, I was informed by two ladies that the codling moth had been present in the orchards of that vicinity for several years past. "In cutting up a pan of apples they usually found two or three wormy ones." No more orchards were seen until the home of Mr. L. B. Feller was reached, seven or eight miles farther out on the Roseburg road. Here I found the first codling moth larvae I had seen on the entire trip, and was told by Mr. Feller that they had been present each season for the past three or four years. From Mr. Feller's place, a ride of some sixteen miles, during which no orchards were passed, took me to Camas. Here wormy apples were to be found in every orchard, a condition of affairs that proved to be true in the orchards between Camas and Roseburg.

As a result of this trip I became convinced that at the time (1900) the codling moth was not present, to any great extent at least, in the Coos Bay region. I also became convinced that the present immunity can be accounted for on the ground of isolation rather than that of peculiar climatic conditions, and that it is not likely to be permanent. Coos county is a beautiful region, broken, mountainous and timbered. Its only connection with the outside world is by boat, or by wagon roads over the mountains from Drain or Roseburg. The codling moth must of necessity be introduced by one or more of these routes. As shown above, the absence of orchards in the immediate vicinity of Empire and Marshfield, render it unlikely that the moth could obtain a foothold even though repeatedly introduced at these points in imported fruit. From Drain it has advanced from orchard to orchard nearly to tide-water at Scottsburg, where it has been checked by the absence of other orchards to conquer. From

Roseburg it has spread along the Roseburg-Myrtle Point route over the mountains to within ten or twelve miles of the latter place and is reported in several orchards about there. It is also reported in orchards about the headwaters of Coos river, having probably advanced from orchard to orchard along the wagon road from Roseburg to Coos Bay as it has along the Roseburg-Myrtle Point route.

It seems evident that the reason for the present immunity from codling moth ravages in the orchards of the Coos Bay region is not far to seek. On account of its geological conformation, the highways leading to this region mostly follow the windings of the streams in and out among the timber-covered mountains. The orchards, mostly home orchards, are located here and there along the highways in little valleys or pockets between the mountains, often at considerable distances apart. Each orchard, or little group of orchards, is therefore protected by a natural barrier of timber and mountains, practically insurmountable to the codling moth unless it be carried over or around it by human agencies.

I believe the idea that climatic conditions are responsible for the absence of codling moth injury has been decidedly harmful. It has carried with it the idea that no effort is necessary to keep the orchards free from this, the greatest apple pest. I believe that by a rigid system of orchard inspection put in operation a few years ago along the highways leading from Roseburg to Myrtle Point and Coos Bay, and a rigid quarantine of infested fruit, that it would have been possible to exclude the codling moth from this entire region for years to come. It is probably too late now. Still there are undoubtedly many isolated orchards in which it is not yet found and which can be kept free from its ravages for years by a little effort. The utmost care should be taken to prevent its introduction into such orchards either in infested fruit or in the packages in which such fruit has been packed.

So far as the codling moth is concerned the Yaquina Bay region is essentially the same as the Coos Bay region. The codling moth has as yet caused no serious injury there; and the impression is quite generally held that conditions are such that it will not thrive. That it is present, however, is shown by the presence of wormy apples in the horticultural exhibit at the county fair held at Toledo in the fall of 1901. There as elsewhere in the state, where the pest has not as yet gained a firm foothold, it would seem far better for the fruit growers themselves to establish a strict orchard inspection and fruit quarantine in the attempt to check its spread rather than to rely on the vain hope that ocean breezes will compass its destruction. Other localities have been buoyed up with the same hope only to have it shattered with the passing of the years. In the Oregon Agriculturist and Rural Northwest, January 15, 1899, occurs the following quotation from the Pajoronian of Watsonville, California: "The codling moth has not been kept out, for any great length of time, of any of the districts where apples are produced for general sale. Every new apple district is 'without the codling moth territory.' We have talked that way about Pajaro valley; but the codling moth has not kept away

because of fogs or the fact that this district is within ten miles of the coast. * * * It will not be kept down by fogs and ten-miles-from-the-coast belts, alone. Active and intelligent work is necessary to check the ravages of this great apple pest, the most serious foe of Pajaro valley's greatest crop."

The mere fact that the codling moth is a serious pest in England, on the continent of Europe from Mediterranian regions to the northern limits of apple growing in Siberia, in southern Africa, Australia, New Zealand, Tasmania, China and most of the fruit growing regions of the United States and Canada, would indicate that the slight variation in climatic conditions which occurs between localities in this state in which the codling moth is a serious pest and those other localities only a few miles distant in which it is yet scarce or absent is not enough to account for its absence or scarcity.

NOT MORE DESTRUCTIVE HERE THAN ELSEWHERE.

While I cannot, therefore, concur in the optomistic belief that any of the sections of the state devoted to apple growing are to remain permanently free from codling moth injury, neither can I agree with the pessimistic statement sometimes heard that such injury is much more serious here than elsewhere. Even approximately accurate estimates of the losses caused by any insect are difficult to make. In 1897, Mr. H. B. Miller, ex-president of the State Board of Horticulture, stated that a very moderate estimate of the loss in that year from scale, moth and scab was one hundred and fifty thousand dollars. An editorial in the Oregon Agriculturist and Rural Northwest, December 15, 1898, states that "The codling moth is about as interesting an insect to the freight managers of Oregon railways as to the fruitgrowers themselves. If it had not been for the ravages of that insect it is probable that the shipments of apples from the state this season would have been increased by at least a thousand carloads."

Simpson* states that fifty per cent of the apple crop of Idaho was destroyed by the codling moth in 1900, the injury ranging from five per cent in some well cared for orchards to one hundred per cent in small orchards and isolated trees.

I have myself repeatedly observed individual trees, both in Oregon and Washington, on which it was practically impossible to find a wormless apple although the trees were loaded with fruit. I have not noticed, however, that the average annual loss is relatively greater here than in Michigan. I believe it is not.

Eighty years ago Kollar wrote that in Germany more than half, particularly of the choice fruit, was eaten into by the apple worm, and Stainton, a celebrated English entomologist, stated * that in 1868, in the vicinity of London it was scarcely possible to find a single fruit uninfested by the codling moth although there was an abundant apple crop. Recent reports

* Bul. 30, New Series, Div. Ent. U. S. Dept. Agr.
* See Am. Ent. Vol. I, 1869.

seem to indicate that the injury is still as great in some parts of Europe as in America. During the past half century the losses in this country from the ravages of this pest have been enormous. Hardly a horticultural report from any apple growing region is to be found that does not mention its destructive work. In 1887, Forbes † made careful observations that led to the conclusion that the annual loss in Illinois from the codling moth is not less than $2,375,000—one-half the value of the average apple crop of the state. In 1892, the loss in Nebraska is said to have reached at least $2,000,000. Slingerland ‡ estimates that in New York, with many growers employing modern methods of fighting the insect, the average loss is fully one-third of the total crop—a loss of $2,500,000 worth of apples and $500,000 worth of pears. He also also states that "conservative estimates put the annual loss from its ravages, in all countries where it is noticeably destructive and but little is done to check it, at from twenty-five to seventy-five per cent of the crop of apples, but with pears the loss is considerably less."

I do not intend to argue that the codling moth will become equally destructive in all localities or that the degree of its destructiveness is entirely independent of climatic conditions. It is known that the seriousness of its depredations varies both with the locality and with the season. It is admitted that "temperature is the great factor which controls the geographical distribution of life, and temperature is at the back of all those apparent living first causes which control the abundance of a species in a given region, provided we trace them far enough." I do wish to suggest, however, that in the case of an insect that has exhibited such a wide range of adaptability to varied climatic conditions as has the codling moth, that it is not likely that anywhere within the limits of this state are these conditions to be relied upon to prevent its development in injurious numbers.

I believe that neither actual nor prospective fruit growers should allow themselves to be in the least discouraged by reports of the unusual destructiveness of this insect in the Pacific Northwest. Its ravages are serious to be sure, but so they are in other apple growing centers. No doubt there are localities in which the codling moth has been present but a comparatively short time, where the injury has been excessive during one or perhaps several years. The balance of nature has not been struck. The various enemies of the moth are not yet doing their share in reducing its numbers. Such conditions have occurred and do still occur elsewhere, seasons of excessive loss alternating with seasons of comparatively little injury. I believe a candid examination of the facts should give hope for the future.

NUMBER OF BROODS IN OREGON.

I feel somewhat more diffident about touching upon the story told by entomologists regarding the numbers of annual broods of the codling moth

† Bul. 1, State Ent. of Ill.
‡ Bul. 142, Cornell Univ. Expt. Sta. The best account of the insect ever published.

in the Pacific Northwest. Observations for the past six years have led me to a different conclusion than that arrived at by my associates. Washburn* states that there are at least four broods in Oregon. Aldrich† reports three broods in the section from Boise to Weiser and about Lewiston and part of a fourth about Boise. Simpson‡ states that there are three broods about Boise and the greater part of the Snake river valley. Parts of eastern Oregon are similar to the sections of Idaho mentioned, and should the conclusions of Aldrich and Simpson prove to be correct, three broods may likewise be expected in the eastern part of the state.

However, I have been entirely unable to find any evidence to support Washburn's conclusions and I believe the others, likewise, will eventually prove erroneous. In every instance, so far as I have been able to determine, statements regarding third and fourth broods are based on inferences and not on actual breeding records. Washburn, judging from his published account, determined the length of time required for the development of the first brood. Having done this by a process of simple division, he showed "how easily four broods can appear during our long warm seasons."

To make his ideas more easily understood he embodied them in the following table:*

	A	*B*	*C*	*D*	*E*
Moths emerge from cocoons	June 1	June 20	Aug. 9	Aug. 28	Oct. 17
Egg laying (when moths are about 10 days old)	June 11	June 30	Aug. 19	Sept. 7	Oct. 27
Hatching of eggs (5-10 days)	June 21	July 10	Aug. 29	Sept. 17	Nov. 6
Life of larvæ in apple (4 weeks)	July 19	Aug. 7	Sept. 26	Oct. 15	Dec. 4
End of larval and pupal stages in cocoon (3 weeks) and emergence of moths	Aug. 9	Aug. 28	Oct. 17	Nov. 5 or following spring	Emerged following spring

Columns A, C and E are supposed to represent the broods which might develop from moths that were assumed to have emerged June 1 and deposited eggs June 10. Columns B and D represent the broods that should develop from moths that emerged June 20 and deposited eggs June 30. So far as the latter columns are concerned it may be assumed that they are approximately correct except for the implied inference that at least a partial brood of moths would appear November 5. The data furnished do not support the conclusion he draws from columns A, C and E that "the moth is at least four broods in Oregon." Moths are assumed to emerge June 1 and deposit eggs June 11, but on the same page the statement is made that eggs were found (June 28) long before any wormy apples were found. Further, according to his calculations the moths that are to deposit eggs for the third brood of larvae should issue about the middle of October. There is no evidence, however, that he ever bred any moths at

* Bul. 25, Or. Expt. Sta.
† Bul. 21, Idaho Expt. Sta.
‡ Bul. 30, New Series, Div. Ent. U. S. Dept. Agr.
* See Bul. 25, Or. Expt. Sta.

this time, or even attempted to. I have made the attempt and have as repeatedly failed. The first brood runs through very nicely at Corvallis on Washburn's schedule B and the second brood follows it very well until the larvae are fully grown and have left the apples and spun up in their cocoons, but there they remain. Instead of transforming to moths that should deposit eggs for a third brood of larvae they persist in remaining as larvae until the following spring. In other words, instead of four estimated broods I find only two actual broods.

I cannot be so certain regarding the number in eastern Oregon. The Willamette Valley lies wholly within the transitional faunal zone. Parts of eastern Oregon, Washington and Idaho lie in the upper austral. It is possible that there as well as in southern Oregon an additional brood may develop. So far as I can determine from published accounts, however, the development of a third brood has never been proved—it is inferred from the presence of numerous larvae in fruit late in the fall and from band records, both of which may be misleading. Thus Forbes* was lead to suspect the presence of a third brood in southern Illinois in 1886 from the unusual abundance of larvae late in fall, but Le Baron† had bred but two broods at Chicago and Riley‡ had invariably found it double brooded at St. Louis. A third brood has been reported in Kansas and in Nebraska and Gillette was for a time under the impression that it also developed in Colorado, parts of which, together with Kansas and Nebraska, lie in the upper austral zone, but in a recent letter he writes me that there is not the least evidence of even a partial third brood any where in the state. In California, Coquillett's§ notes indicate that it is three brooded, but Koebele‖ reports it as two brooded as a rule in the Santa Cruz mountains and that it will not differ in its habits to any extent throughout California. Washburn's statements regarding the third and fourth broods at Corvallis is without any foundation of facts; while those of Aldrich and Simpson for Idaho seem to be based principally on band records which may be misleading from the fact that the relative number of larvae found under the bands at different times may depend upon whether the evening temperature some four or five weeks previously to the time the record was taken was favorable or not for active egg laying by the moths, as well as upon the appearance of another brood of moths. Cockerell§§ alone seems to have established pretty conclusively the presence of a third brood in parts of New Mexico, but since the moths of this brood began to appear as early as August 21, it is possible that a wrong interpretation has been placed upon the observed facts. So far as the evidence available at present can be relied upon it would seem that the burden of proof still lies with those who maintain the existence of a third brood. One and two broods have been repeatedly bred in various parts of the world. A third or fourth never

* Fifteenth Report State Entomologist (1885-1886).
† Third Report on Insects, Ill.
‡ Am. Entomologist, Vol. II (1870).
§ Bul. 30, Div. Ent. U. S. Dept. Agr.
‖ Bul. 22, Div. Ent. U. S. Dept. Agr.
§§ Bul. 25, New Mexico Station.

has been bred, and I believe it is at least doubtful whether it ever develops. If the number of broods is governed at all by faunal zones it would seem from the evidence that one brood only is to be expected in the boreal zone, a partial or complete second brood in the transition zone and a complete second with a bare possibility of a third brood in the upper austral.

Whether or not a third brood ever develops is of very little practical importance to fruit growers. Owing to irregularity of development, the different broods so overlap that the insect can be found in all stages during most of the time from July 1 to September 15. The facts remain that throughout this western country the larvae are very abundant late in the season and cause far more loss than all other apple pests combined. There is thus a constant demand from apple growers for information as to the habits of the insect, and the best methods of reducing its ravages. It is the purpose of this bulletin to supply this information and at the same time to record my own observation and experiments.

DESCRIPTION AND LIFE HISTORY.

When fully grown in fall, each larvae usually leaves the fruit in which it developed, seeks some secluded spot and spins about itself a silken cocoon in which it passes the winter. Late in March, some of these larvae transform to pupae from which the moths emerge about the first of April, and from this date moths are continually emerging until the first part of July.

The accompanying illustrations show the size and general characteristics of the moths. They are really beautiful little creatures. The abdomen and the hind wings, which are covered when the insect is at rest, are of a modest greyish brown color. The ground color of the fore wings is similar, but is relieved by transverse, wavy, alternating bands of grey and brown. Perhaps the most characteristic marking is a large golden-bronze spot at the inner hind angle of each front wing. I know of no other common insect with this mark and no insect in which it is absent need be mistaken for the codling moth. The males are further distinguished by a narrow pencil of black hairs on the upper surface of the hind wing and an elongated blackish spot on the under surface of each front wing. Owing to its peculiar coloring which harmonizes well with the color of the bark, and the habit of usually remaining quiet during the daytime, it is rare indeed to find a fruit grower who is acquainted with this beautiful but destructive little insect. Indeed, I find that commonly the most widely divergent ideas are held as to its appearance, and unscrupulous persons rely upon this widespread ignorance to advertise and sell "trap lanterns" and other worthless devices for capturing the moths. Only a slight knowledge of the appearance of the moth is needed to convince even the most credulous that the masses of insects caught by such means rarely contain a codling moth. Such a knowledge can readily be obtained by picking some wormy apples in July or August and placing them in some closed receptacle. In the course of a few weeks the moths will emerge. When once familiar with their appearance one may detect them flitting about the

trees at dark depositing their eggs upon the fruit, and more rarely upon the foliage, and may occasionally observe them during the daytime resting quietly upon the leaves or bark. I have also rarely found them resting upon the ground.

It is usually stated that the moths appear in spring about the time the apple trees are in bloom. Slingerland* sums up his own observations as well as those previously published by other observers with the statement that "what little definite evidence there is upon this point indicates that the majority of the moths do not emerge until several days after the petals have fallen."

At Corvallis there seems to be no relation, whatever, between the time at which the apple trees are in bloom and the dates on which the moths emerge. In 1896, apple trees were in full bloom April 20 and most of the petals had fallen by May 1. Only a few moths were reared that season, but some of these emerged as late as the middle of June. In 1898, the trees were beginning to blossom April 10 and the blossoms had mostly fallen by April 28. In a storeroom moths began to appear as early as April 10 and on June 16 two perfectly fresh specimens were captured in the orchard. In 1899, moths began to appear in breeding cages April 10 and continued to emerge to July 1. April 21, the earliest apple trees were just coming into blossom and the petals were not all off before May 10. Although the apple trees were in blossom nearly two weeks later in 1899 than in 1898, the moths began to appear at practically the same time (April 10-11) and continued to emerge for nearly or quite two months after the blossoms had fallen.

A still more remarkable variation from the usual habits of the insect as recorded from other localities, exists in the times at which the moths deposit their eggs. The idea held until recently was that the eggs are laid in the calyx or blossom end of the fruit soon after the blossoms fall. This idea was first shown to be erroneous by the observations of Koebele in 1888.* In September he found only about one pear in twenty without eggs or young larvae of the codling moth. "As many as eleven eggs were found upon a single pear. One was found on the stem, six on the pear surrounding the stem, two on the upper half and the other two near the calyx." Since then the fact that the eggs are not laid in the calyx but upon the exposed surface of the fruit, has been verified by Washburn, Slingerland, Card, and others, and Card has also called attention to the fact that they are sometimes deposited upon the leaves.

In New York, Slingerland found eggs upon the fruit the last week in May (1896-97), a week or more after the blossoms had fallen. Gillette states that in Iowa in 1889 no larvae had hatched until nearly a month after the blossoms were off. Allowing for an existence of a week or ten days for the egg stage would bring the date of oviposition from two to three weeks after the petals fell. In 1887, Card observed that while the

* Bul. 142, Cornell Univ. Expt. Sta.
* Bul. 22, Div. Ent. U. S. Dept. Agr. (1890).

petals were mostly off by May 10, the first eggs were not found until about three weeks later.

At Corvallis egg laying is delayed until a much later date. April 10, 11 and 12, 1898, moths were placed in breeding cages with fresh blossoms for the purpose of obtaining eggs. None were obtained, however, and neither eggs nor larvae were seen upon fruit out of doors until July 1, when a single recently hatched larvae was found just beneath the skin of a Waxen apple. July 4 three more were found, and on July 7, 97 of the 475 apples on the tree were found to contain young larvae. Allowing a maximum of ten days for the egg stage brings the date at which the very first eggs were deposited at June 21, while egg laying evidently did not become general until about June 28. As shown above, the petals had fallen by April 28, about two months before. In 1899, however, moths were placed in breeding cages with fresh blossoms on April 21, 22, 25, 29, May 4, 5, 8, 9; and on May 11 ten eggs were deposited. At this time the petals had been off the trees scarcely more than two weeks. However, no eggs or larvae were obtained on fruit on the trees until June 28 when numerous eggs and very young larvae were found on Ben Davis apples. In 1900 the blossoms were mostly off by May 1. The first egg was seen June 11, another June 14 and the first larvae June 26. It appears from the above observations that while the blossoms fell at various dates from April 28 to May 10, egg laying rarely begins before the middle of June and is not general, much if any before June 25. This does not hold true for the dryer and warmer parts of the state, nor is it necessarily true for the entire Willamette valley. In southern Oregon and parts of eastern Oregon egg laying certainly begins in May, and reports from various parts of the Willamette valley indicate that the date at which the first larvae begin to work in fruit at Corvallis is unusually late even for this section.

EFFECT OF EVENING TEMPERATURE ON HABITS.

I have been somewhat at a loss for a satisfactory explanation of this variation from the normal habits of the insect. Knowing that the moths are most active just as dusk, I have attempted to account for it on the ground that our evenings are unusually cool throughout May and the greater part of June. Corvallis lies directly opposite a gap in the Coast range of mountains, which may account for the fact that it is daily blessed with a cool sea breeze which rapidly lowers the temperature after three or four o'clock in the afternoon. It is possible that this low temperature may account for the delayed oviposition. To bring out this point more clearly I have compiled the following table showing the daily temperature at 8 p. m. from May 1 to October 1, practically the entire period during which moths are on the wing here, for the years 1898, 1899, 1900 and 1901. The record for May and September, 1898, was not available.

Records of this character for only four years, and for one locality only, do not prove anything. They may, however, be suggestive. In this instance, if they show anything, it is that the moths do not deposit eggs when the evening temperature falls much, if any, below sixty degrees, and

that as the temperature raises above that point the activity of the moths increase. I have never seen eggs of the codling moth out of doors here in May. A glance at the table will show that very rarely indeed does the evening temperature reach sixty degrees during that month. The average for the month is only fifty-three degrees. Egg laying, as shown above, ordinarily begins about the middle of June and becomes general towards the close. The average evening temperature for June is just sixty degrees, and rarely does it go above sixty-five degrees. It is also continued during the first part of July, but since the emergence of but few moths of the first brood is delayed until the latter part of July, and but few of the second brood emerge so soon, the temperature of the latter part of July need not be considered. A very large proportion of the total injury done by the moth in the state occurs during August and the first part of September, when the average evening temperature is highest. During this time a considerable number of evenings occur with a temperature of seventy to eighty-five degrees.

TABLE SHOWING DAILY TEMPERATURE AT 8 P. M. FROM MAY 1 TO OCTOBER 1 FOR THE YEARS 1898, 1899, 1900 AND 1901.

Date.	1898.					1899.					1900.					1901.				
	May.	June	July.	Aug.	Sept.	May.	June.	July.	Aug.	Sept.	May.	June.	July.	Aug	Sept.	May.	June.	July.	Aug.	Sept.
	Tem.	Tem.	Tem	Tem.	Tem.	Tem.	Tem.	Tem.	Tem.	Tem.	Tem.	Tem.	Tem.	Tem.	Tem.	Tem.	Tem.	Tem.	Tem.	Tem.
1	----	----	66	84	----	43	50	67	67	63	60	59	63	64	59	50	57	53	70	60
2	----	----	65	66	----	48	58	65	73	59	61	65	61	67	66	48	65	58	70	63
3	----	----	62	68	----	53	52	52	75	58	69	61	61	65	54	51	52	57	80	62
4	----	----	59	79	----	50	53	50	74	55	58	67	62	62	60	51	55	64	85	59
5	----	----	67	67	----	47	47	54	71	57	55	58	65	63	66	51	56	63	82	55
6	----	71	68	61	----	54	53	53	70	54	54	72	67	57	61	55	53	62	78	56
7	----	71	65	63	----	60	60	52	63	62	60	71	70	59	57	55	52	55	69	61
8	----	73	60	64	----	52	67	55	61	66	62	63	73	53	62	56	53	63	69	60
9	----	69	65	75	----	55	67	55	62	67	59	76	73	62	----	57	56	64	71	70
10	----	55	68	64	----	56	60	54	66	71	56	68	60	59	----	66	60	63	73	61
11	----	59	60	68	----	48	52	60	70	63	52	75	52	61	----	64	55	61	74	63
12	----	60	60	71	----	49	53	60	62	58	53	72	58	60	60	56	58	60	76	62
13	----	57	60	70	----	45	60	64	55	55	59	63	58	82	55	58	52	60	77	61
14	----	59	70	71	----	51	63	64	59	58	62	58	60	81	51	55	62	67	85	70
15	----	58	61	69	----	46	70	61	61	59	55	60	53	73	54	58	65	64	68	78
16	----	62	61	67	----	47	71	71	59	60	58	61	61	74	55	55	71	61	71	77
17	----	67	65	63	----	46	70	73	66	57	58	61	63	75	55	49	72	63	65	80
18	----	58	60	63	----	47	75	73	60	----	56	66	77	76	59	50	59	60	59	59
19	----	55	57	62	----	48	55	69	61	----	59	69	76	80	61	48	61	62	62	58
20	----	52	49	64	----	50	55	65	54	----	62	63	72	57	62	58	58	65	62	54
21	----	50	57	61	----	56	67	62	56	----	58	61	65	69	56	55	55	67	70	56
22	----	50	51	68	----	52	67	67	60	----	56	67	60	69	51	54	51	68	70	54
23	----	60	55	78	----	54	60	80	66	----	52	67	62	64	55	55	51	64	61	53
24	----	52	56	63	----	50	58	70	61	----	58	60	63	68	54	70	54	65	65	56
25	----	58	74	59	----	52	56	75	60	71	48	62	64	65	55	74	55	65	59	58
26	----	54	78	61	----	52	54	73	55	69	54	72	62	66	60	59	58	65	65	56
27	----	----	87	61	----	50	58	70	62	64	51	60	72	60	55	58	60	66	68	54
28	----	----	85	69	----	52	58	60	62	59	55	61	75	64	53	53	56	66	69	61
29	----	64	85	59	----	48	57	62	96	59	63	58	80	60	49	54	54	65	71	63
30	----	55	80	55	----	52	57	60	74	55	62	62	82	65	52	62	60	62	61	56
31	----	60	80	53	----	56	----	62	59	----	57	----	83	60	----	67	----	70	63	----
Av.	----	59†	65†	66	----	50†	59†	63†	64–	61–	54†	64†	66	66–	57†	56†	57†	60–	70–	61

THE EGG.

The eggs of the codling moth are minute scale-like objects about one-twentieth of an inch in diameter. They may be likened to a very small trout scale glued to the surface of the leaf or fruit. Being so small and at the same time transparent, or with only a slight yellowish tinge, they can be detected only with difficulty by those unfamiliar with their appearance. When once familiar with them, however, and every apple grower should become familiar with them, one can readily find them in this vicinity at any time from late in June until at least October 1, and probably later. So far as my observations go, they are found much more commonly upon the fruit than upon the leaves, although undoubtedly when fruit is scarce they may be more abundant upon the leaves. The white spot on the apple, c, in the illustration is to represent the size and position of an egg.

The duration of the egg stage probably depends somewhat upon temperature. According to recorded observations, it may range from four to ten days. A large number of eggs were deposited in one of my breeding cages, September 5, 1898. September 10, the developing larvae could be plainly seen through the shells and most of them emerged September 12, seven days after the eggs were deposited. This corresponds with Slingerland's observations in New York and is undoubtedly, as he suggests, about the average duration of this stage. Several of the larvae were seen to emerge from the egg. In every instance they broke through the upper shell and entered the fruit at some other point. Simpson, however, mentions instances in which the larvae had evidently eaten directly through the lower surface of the shell into the fruit. If such a habit were general our poison sprays would, of course, be valueless.

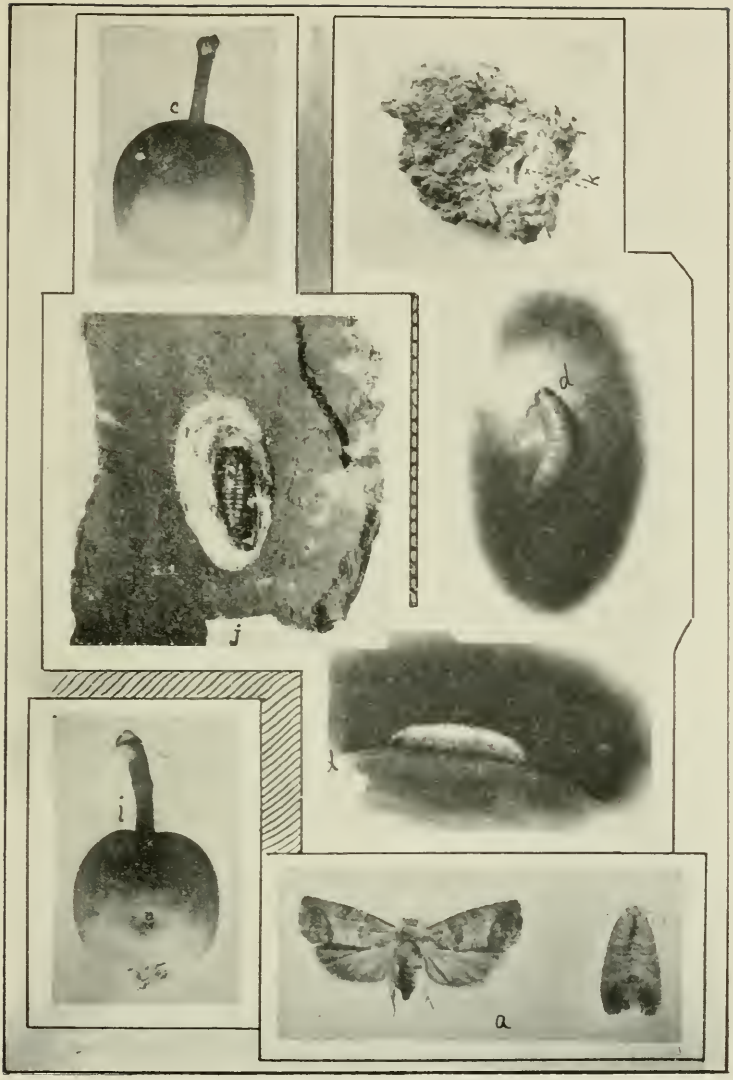
THE LARVAE.

When first hatched the young larvae are scarcely more than one-sixteenth inch long, semi-transparent or whitish in color and marked with little black spots each of which bears a minute hair. The head, and the thoracic and anal shields are black.

True to the instinct of self preservation, the young larvae attempt to get under some protecting cover as soon as possible. Crawling here and there over the surface of the fruit, they seek some secluded spot where they may be hidden from their numerous enemies. This undoubtedly accounts for the fact that a large proportion of them enter the fruit at the blossom end,

THE CODLING MOTH.

Fig. a. The moth with wings folded and with wings expanded. Enlarged 1½ dia.
Fig. c. The white spot on the apple is intended to represent the position and size of an egg.
Figs. dd. The full grown larva resting on the surface of an apple. Dorsal and lateral views. Both natural size.
Fig. i. Shows point of entrance of larva at side of growing apple. Somewhat reduced.
Fig. j. A cocoon on the under surface of a piece of apple bark. Cocoon has been torn open to show inclosed pupa. Enlarged 1½ dia.
Fig. k. A clod of soil containing a pupa of the codling moth. Position of pupa indicated by x. Reduced one half.



THE CODLING MOTH (Original.)

at the point of contact of two apples, or where a leaf rests upon a fruit. Failing to find such a sheltered spot, the young larvae spins a web of a few silken threads on the surface of the fruit, evidently to give a firmer foothold, and immediately attempts to bite through the skin. One that I observed succeeded only after several ineffectual attempts, and while making these attempts and in burrowing into the fruit, as much haste was exhibited as a soldier under fire would probably exhibit in constructing a rifle pit. In a little more than an hour it had excavated more than its full length into the fruit, enlarged the cavity so that it could turn about in it and spun a silken protecting web across the entrance. The reason is evident why the codling moth in its larval stage within the fruit is subject to the attacks of so few enemies.

Once beneath the skin or within the protecting folds of the calyx, the young larvae may feed for several days near the surface, or it may proceed at once towards its objective point, the core, where it feeds upon the seeds and excavates irregular cavities which are filled with masses of filthy droppings matted together with silken threads. (See Figure g). Its presence in the fruit can soon be detected by the presence of the familiar frass which is crowded from the burrow and remains matted about the entrance probably as a further barrier to the entrance of enemies. (See Figures e and i.) As it increases in size, the head and thoracic and anal shields turn from black to brown and the body acquires a pinkish tinge. (See Figures d. d.) Some days before it stops feeding the larvae eats an exit passage to the surface of the fruit but takes the precaution to close the opening with a protecting pellet of frass and silken threads. When full grown it pushes this pellet aside and leaves the fruit.

The length of time required for the larvae of the first brood to become full grown varies greatly. Some accounts give a period of only ten to fourteen days; others as much as thirty-three days. As stated above, in 1898 the first larvae was found in fruit July 1, and not until July 7 could any considerable number be found. The latter were very small, certainly not over four or five days old. They were placed in breeding cages and July 19 the first one left the fruit and began to spin its cocoon. The others continued to emerge until July 26. This gives in this particular instance a larval period in the fruit of sixteen to twenty-four days.

THE PUPA.

The summer and most fall varieties of apples ripen and fall prematurely when attacked by codling moth. Winter varieties exhibit no such tendencies. Whenever an apple containing a larvae falls to the ground, the larvae usually leaves it at once and seeks some hidden place in which to spin its cocoon. Only very rarely is it spun within the fruit. A very large proportion of the larvae leave the fruit while it is still upon the tree, unless a heavy wind or other agency causes it to fall unusually early, either letting themselves to the ground by silken threads or crawling from the fruit to the twigs and thence downward along the branches until a suitable place is found in which to pupate. The old neglected orchard is the delight

of the codling moth. Amongst the rubbish on the ground and in the fence corners, and under the loose scaly bark of its moss-covered limbs, are numerous choice spots in which it can pass through its wonderful transformations securely hidden from all foes. Many larvae of the second generation are yet in the fruit where it is gathered and are carried with it into the storerooms. There they too find suitable place in which to pupate in cracks and crevices about the room and the packages in which the fruit is stored. In fact, when such storerooms are in proximity to orchards they form a prolific source of infection in spring unless some method is employed to prevent the escape of the moths. It is also certain that the principal means by which the insect is introduced into new regions is in the packages in which infested apples or pears have been packed.

It would be interesting, and perhaps profitable, to know where all the larvae spin their cocoons in well cared for orchards of smooth young trees. Four or five years ago Mr. H. B. Miller, a successful orchardist of Grants Pass, suggested to me that many of them must pupate in the soil. Mr. Miller based his suggestions on the fact that very few cocoons indeed could be found on his trees; and that he believed he had obtained good results in lessening the amount of codling moth injury in his orchard by frequent cultivation. In 1898 at least seventy-five per cent of the Ben Davis apples in a certain orchard near Corvallis were rendered unmarketable by codling moth injuries. In fact the crop was not gathered. Hundreds of wormy apples lay on the ground under every tree. Late in the fall I examined six of these trees carefully. They were not old. The bark was smooth and healthy except for an occasional spot of apple tree anthracnose. On the six trees I found less than a half dozen cocoons. Most of these were in a piece of cloth that had been left in a crotch; only two or three were found on the trees proper and these were about old anthracnose scars. I was convinced that most of the larvae must be secreted under clods and other objects on the ground or about the crowns of various plants; but together with an assistant, I spent several hours in searching for them without finding a single one. Neither have I ever found any in such places in well cultivated orchards. Nevertheless I believe that in well cared for orchards of clean smooth trees, the larvae do spin their cocoons under clods or any other objects that may lie upon the surface of the soil; and that frequent cultivation may thus be of value by destroying them or exposing them to their enemies. August 15, 1900, I found one larvae in its cocoon, two live pupae and a number of empty pupae cases in small cracks in the uncultivated soil under an apple tree. Figure k shows a cocoon in a cell in a clod. The bark on this tree was rough and scaly and considerable rubbish lay on the ground under it. There were thus many normal places in which the larvae could have spun their cocoons; that they chose to do so in the ground would seem to indicate that the habit is not unusual. Cooke* states that the cocoons are often found from one to six inches beneath the surface of the soil about the trunk and larger

* Injurious Insects of the Orchard and Vineyard, p. 102.

roots. Simpson† states that many are placed in cracks in the ground and that a Mr. McPherson reports having found many among the clods of earth in the orchard. Undoubtedly the larvae prefer to pupate under scales of bark on the trunk and larger limbs or in other dry secluded places above the ground—in breeding cages they almost invariably go to the top—but it seems evident that under certain circumstances they may pupate on or beneath the surface of the soil, and that clean smooth trees and clean culture are valuable aids in the warfare against this pest.

Having found a suitable place, whether it be on trunk or branch, in barrel, box or storeroom or under a clod, the larvae hollows out a little oval cavity with its jaws and proceeds to envelope itself in a thin tough cocoon of silken threads intermingled with particles of the surrounding substance. Figure h shows a larvae in a winter cocoon, on the under surface of a piece of bark. If the cocoon is formed by a larvae of the first brood, in July or early August, in two or three days it will undergo a wonderful transformation—a complete change of form. It is then a pupae. A larvae of the second brood remains as a larvae within its cocoon until the following spring when it too transforms to a pupae. A pupae somewhat enlarged is shown in Figure j. Whether the change to the pupae occurs in a few days as in the first brood or is delayed until spring as in the second, the insect remains in the pupal stage only two or three weeks. Then, by wriggling movements, aided by the spines on the back of each segment, the pupae works its way out of its cocoon and is born again. It is then a most beautiful object—the moth. In breeding cages, moths of the first brood emerged August 3, from cocoons that were spun July 19, and in which the larvae pupated July 21. Moths of the second brood, which had developed from eggs deposited September 5, and hatched September 12, emerged May 29.

To show more clearly the times at which the moths appear I have compiled the following table from breeding cage records for 1898-99. Beginning July 7, 1898, when the first wormy apples were found, infested fruit was gathered from time to time throughout the season and placed in cages. The same process was followed in 1899. Careful record of the dates of appearance of the moths was kept throughout the fall of 1898. In 1899, during my absence the records were efficiently kept by Mr. W. J. Gilstrap, a student assistant, until September 7, when he resigned. However, on September 2, he observed that many moths of the second generation had not emerged. It is, therefore, probable that they would have continued to emerge at least until September 15, as in 1898.

† Bul. 30, New Series, Div. Ent. U. S. Dept. Agr.

TABLE SHOWING DATES OF APPEARANCE OF MOTHS IN 1898-99.

1898		1899.							
Date.	Number of moths.	Date.	Number of moths.	Date.	Number of moths.	Date.	Number of moths.
Aug. 3	5	April 10	1	May 23	3	Aug. 5	3
5	2	21	4	25	3	7	4
6	1	22	1	27	5	8	1
11	6	29	1	29	3	9	3
14	4	May 3	1	31	1	12	5
19	6	5	2	June 1	4	15	2
Absent until		8	9	5	4	18	3
Sept. 3	44	9	2	27	10	19	1
5	3	13	4	29	1	24	6
8	2	15	6	30	1	28	2
14	2	16	3	July 24*	1	31	2
		18	2	25	1	Sept. 4	1
		19	4			6	1
		22	4	Aug. 4	6	7	1

*The moths recorded July 24-25 were captured in storerooms and may be extra late individuals of the first brood or early ones of the second—probably the latter.

NATURAL ENEMIES.

As a moth, flying only at night; as a larvae, living in a citadel both entrances to which are barricaded; or as larvae and pupae, hidden securely away in the most secluded spots and rendered almost invisible by the protective coloring of its cocoons; it would seem that the codling moth should be safe from all foes. Nevertheless the mortality is great in each of its various stages.

I have observed many shriveled eggs that did not hatch. The same condition has been noted by others, notably Koebele,* Washburn† and Simpson.‡ Washburn states that "the moth lays many eggs, but apparently only a certain proportion of them develop." He thus conveys the impression that the mortality is due to lack of fertilization. Simpson attributes it to climatic conditions. Both may be right. I have noticed that in breeding cages protected from the sun nearly every egg hatches. In California and in the east, a minute parasitic insect lives in and destroys a few of the eggs. It is probably present in Oregon, but I have as yet not detected it.

In Utah a wasp is reported to collect the larvae and store them in its burrows, while the fruit in a neighboring orchard was almost free from injury. In California, another wasp is said to pull the larvae from the apples; while in Indiana the same good office is performed by the downy woodpecker. It is not at all uncommon at Corvallis to find a considerable percentage of the larvae dead in the fruit; some killed by a fungous disease; others evidently by a bacterium.

After leaving the fruit, and while seeking a place in which to pupate the larvae are subject to the attacks of numerous predaceous and parasitic insects and many birds, which also continue to prey upon them both as larvae and pupae after they are hidden away in their cocoons.

* Bul. 22, Div. Ent. U. S. Dept. Agr.
† Bul. 25, Or. Expt. Sta.
‡ Bul. 30, New Series, Div. Ent. U. S. Dept. Agr.

Even the moths are captured, while on the wing, by bats and probably many fall a prey to birds, both while at rest during the day and while on the wing at night. At least fifteen species of insects, one hair snake, a fungous disease, a bacterial disease and many species of birds are known to prey upon the codling moth during some stage of its existence, and yet it ranks as the most destructive apple pest.

The idea of controlling crop pests by their natural enemies is a popular one; and there are not lacking enthusiasts who advocate, with little reason, the introduction of this or that particular enemy, or the artificial culture and use of one already present, as a cheap and efficient method of controlling the codling moth.

In July, 1898, nearly eighty per cent of the larvae infesting the Waxen apples on a certain tree were killed by disease. Two distinct types of disease were noticeable; one a fungus which produced a solid or mummified condition of the larvae; the other evidently a bacterium which induced decay. I was, at first, impressed with the belief that organisms which naturally produced such a great mortality among the larvae of the codling moth might be successfully used in orchard practice; but when early in August, the mortality diminished to about five per cent or less, while the larvae were much more abundant, and there was thus more opportunity for the spread of the contagion, I abandoned the idea. It was only too evident that the organisms were too dependent upon favorable conditions for their development, to be reliable agents in insect warfare. Spraying the trees with cultures of these diseases might give good results under certain circumstances; but the results, being so dependent upon conditions, would be uncertain and the practice therefore unsafe. In all economic work with diseases of insects, two conditions have been found essential to success; the climatic conditions must be favorable for the development of the disease and the insect must be gregarious. The first condition cannot be controlled; the second does not exist in this particular instance, the larvae being not only solitary in their habits but deeply buried in the fruit. I, therefore, do not believe the use of disease germs in controlling codling moth can be made practical.

I fully agree with Slingerland* that "the most efficient aids to man in controlling the codling moth are birds. * * * Any one who tries to collect the apple worm on the trunks of trees in early spring, will be surprised to find how many empty cocoons there will be. Usually, however, a tell-tale hole through the back into the cocoon explains the absence of its occupant. Our observations lead us to agree with Riley and Walsh that 'almost all the cocoons of the moth that have been constructed in the autumn on the trunks and limbs of apple trees, are gutted before the spring opens.' * * * One finds such an astonishingly large number of empty cocoons that it would seem as though the birds must get the larger proportion of the worms which go into nibernation in the fall." Probably the flickers and nuthatches should be given first rank as codling moth

* Bul. 142, Cornell Expt. Sta.

destroyers, but they are ably seconded by jays, chickadees, wrens, sparrows, swallows, titmice, kinglets and bluebirds.

Notwithstanding this splendid array of feathered friends of the orchardists, there has been considerable agitation, in this and neighboring states, in favor of importing the Kohlmeise (Parus major) from Germany. It is even reported that the last legislature of Utah appropriated $500 to be expended in making such an importation. The advocates of such an experiment claim that the Kohlmeise is the natural enemy of the codling moth, that in Germany it keeps the moth in subjection, and that if imported to this country it would probably be as effective here.

I believe such an importation would be a dangerous and an unnecessary experiment; unnecessary because we have already in this state three native species of birds which belong to the same genus as the Kohlmeise, and which, in all probability, have very similar habits, viz: The Oregon chickadee (parus atricappillus occidentalis), the mountain chickadees (P. gambeli), and the chestnut-backed chickadee (P. rufescens); dangerous because it is always uncertain what changes in habits may occur when an animal, be it ever so harmless in its native habitat, is introduced to new conditions. In support of this statement it is only necessary to call attention to the introduction of the English sparrow into the United States, the mongoose into Jamaica, the European rabbit into Australia and the starling into New Zealand. Those interested in the subject are referred to an article by Dr. T. S. Palmer* on "The Danger of Introducing Noxious Animals and Birds."

Regarding the Kohlmeise, Dr. Palmer writes as follows:

"'Kohlmeise' is the German name of the great titmouse of Europe (Parus major), and this designation is used to some extent in the United States. The Kohlmeise is common over the whole of Europe as far north as the Arctic circle and also in Siberia. * * * The Kohlmeise has recently attracted attention on account of its alleged value as a destroyer of the codling moth (Carpocapsa pomenella), particularly in Germany, where it is reported to protect apple trees in large measure from the attacks of this destructive insect. But although several German authors regard it as a most useful species, there seems to be no satisfactory evidence that

* Yearbook U. S. Dept. Agr. (1898).

THE CODLING MOTH.

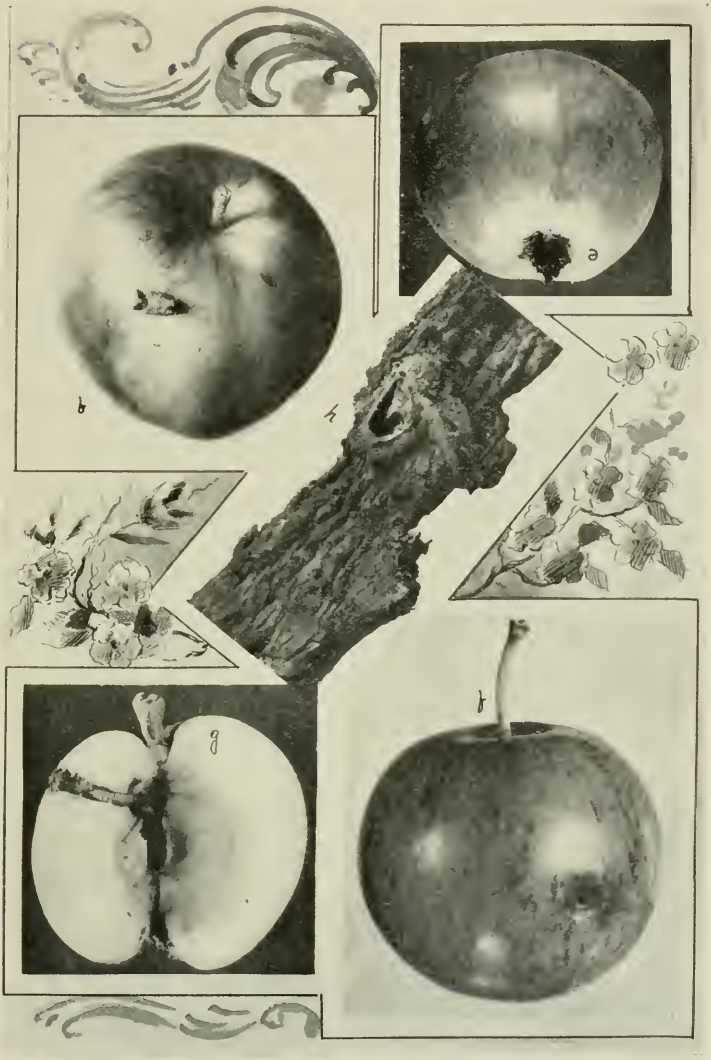
Fig. b. Moth resting on apple. Reduced one half.

Fig. e. Wormy apple showing familiar mass of frass at calyx end. Reduced one half.

Fig. f. Mature apple showing spot where a second brood larva had entered at the side. Reduced one half.

Fig. g. Interior of wormy apple showing point of entrance at calyx, channel to the core, excavation about the core, exit passage, in which is the larva, leading to the surface of the fruit where it is closed with a plug of frass and silken threads. Reduced to one third natural size.

Fig. h. Winter quarters disturbed. A winter cocoon on the under surface of a piece of apple bark has been torn open to show the inclosed hibernating larva. Enlarged 1½ dia.



THE CODLING MOTH (Original.)

it is partial to the codling moth, or in fact that it ever feeds on the moth to any great extent. In Great Britain where the Kohlmeise is also a resident and generally distributed, its presence has not been sufficient to exterminate the codling moth or even to hold this pest in check. On the other hand, it is said to attack small and weakly birds, splitting open their skulls with its beak to get at the brains, and doing more or less damage to fruit, particularly pears. One English observer reported that all the pears in his garden had to be enclosed in muslin bags to protect them from the birds which would otherwise eat a considerable part of the fruit before it was ripe. Another reported that the great titmouse spoiled most of a limited crop of apples, and then began on the pears, boring a small hole near the stem, and passing from one pear to another until every one of forty or fifty trees had been damaged. It also attacked figs, scooping them out before they were ripe." In this country the Kohlmeise might not develop the undesirable traits it has exhibited in England; but its character is not above suspicion. Far better to expend our energies in protecting and fostering the birds we have, than in introducing one that might itself become a pest. Well cultivated and well pruned orchards, free from weeds and seeds and underbrush, are not attractive places to birds, and it is at least doubtful whether the Kohlmeise would remain in them. In Germany, where it is said to do the most good, there are practically no commercial orchards.

I believe there is little prospect that any practical benefit will come from the introduction of foreign enemies of the codling moth, or from attempts to increase the usefulness of those already present. The "strenuous life" of the fruitgrower alone will protect his fruit. He must be persistent in the use of the best known remedies. The most successful orchardists of the state now rely almost wholly upon spraying.

THE CODLING MOTH AND LATE SPRAYING.

The fundamental fact that must be considered by those who aim to control the codling moth by spraying, is that in this western country the larvae are very abundant late in the season. In the Willamette valley, and I believe the same is true in the other apple-growing regions of the state, the greatest loss from codling moth injury occurs after August 1. This fact necessitates a radical departure from the practice which has given such satisfactory results in the east.

Since Cook* first demonstrated the value of the arsenical sprays as a preventive of codling moth injury to apples, early spraying has been the almost universal practice, alike of the fruitgrower and the entomologist. "Apply early, just after the blossoms fall," wrote Cook; and the advice has been echoed—and followed—ever since. The test of years has only served to demonstrate its value. It has been worth millions of dollars to apple growers all over the land. Professor Cook found this one application so effective that he doubted whether it would be best or necessary to make another. Subsequent experience did not fully sustain his expectations.

* Am. Entomologist, Vol. III, 1880.

Forbes* as a result of a very carefully conducted series of experiments covering two seasons, during the first of which certain trees were sprayed eight times, arrived at the conclusion that seventy per cent of the loss commonly caused by the codling moth may be prevented by spraying with Paris green once or twice in early spring as soon as the fruit is set and before it turns downward on the stem; but that "certainly no appreciable effect was produced by spraying during the life of the second brood." Goff† obtained practically the same result. Munson‡ as a result of some careful work noted that a large proportion of fruits infested had been attacked by the second brood but concluded that to spray for this brood is hardly practicable. Lodeman§ states that it is not advisable to apply Paris green more than twice in a season unless the rainfall is very heavy or continuous. Practically the same conclusion has been arrived at by all experimenters in the eastern United States. The subject has been finally summarized by Slingerland|| who concluded that if no rains occur between the time of the application and the closing of the calyx lobes, one spraying just after the blossoms fall is just as effective as half a dozen later applications.

These conclusions, arrived at as the result of years of observation, and the successful experience of many men are not supported by results obtained in this state. Early spraying alone will not save the fruit. It is not only practicable but necessary to fight the second brood. Personally, I am of the opinion that the early applications, soon after the petals fall, are of very little value in the Willamette valley. Here the blossoms usually fall not later than May 10. If the application is to be made before the calyx lobes close, spraying must not be delayed more than a few days after this date. The first larvae enter the fruit at Corvallis rarely before June 25. I have as yet had no analysis made, but in view of our usually large rainfall after the petals drop, I am strongly of the opinion that by the time the first larvae are ready to enter the fruit practically none of the poison of these early sprays remain either in the calyx cup or elsewhere upon the fruit. Nevertheless, contrary to eastern experience though it may be, good results are obtained by the use of the spray pump, by keeping everlastingly at it. To quote from Mr. Smith's article on spraying, in the appendix, "By this sign we conquer." In warmer and dryer portions of the state where the larvae begin to appear sooner the early applications are undoubtedly of great value. Even in the Willamette valley it is not best to omit them until their value has been further tested.

The comparative value of the different applications can best be shown by reference to the following table which records the result of experimental spraying in the college orchard in 1898. Five rows containing one hundred and thirty-four trees were selected for the experiment. Of these fifty failed to produce fruit, or were early varieties of which no records were kept,

* Fifteenth Report Ill. State Ent. (1885-1886).
† Fourth Report N. Y. Agr. Expt. Sta. (1885).
‡ Report Maine Expt. Sta. (1891).
§ Bul. 60. Cornell Expt. Sta.
|| Bul. 142, Cornell Expt. Sta.

since the particular end in view was to test the effect of a late application on larvae of the second brood. There were thus included in the experiment eighty-four trees of fall and winter varieties. These trees with certain exceptions were sprayed four times with Bordeaux mixture to which one pound of Paris green was added to each two hundred gallons. The applications were made May 13, June 11, June 25, and August 11, and at each application certain trees were omitted. In the column marked "No. of applications" the figures opposite any particular tree indicate which of the sprayings that tree received. Thus. 1 stands for the first application, May 13; 2 for the second, June 11, etc. In like manner, 1, 2, 3, 4 indicates that the tree received all four applications; 2, 3, that it received only the second and third. At the time the first application was made the condition of the calyx was noted for each variety and this is recorded in the column marked "Condition of calyx," as open or closed. Immediately after the third application I, personally, counted the apples on each tree, and again July 20 went over them and counted all that showed indications of being infested by larvae of the first brood. When the fruit was gathered it was carefully examined, the apples that showed the least indication of injury counted, and the percentage of wormy to sound fruit estimated.

TABLE SHOWING RELATIVE EFFECTS OF EARLY AND LATE SPRAYING IN 1898.

Variety.	*Condition of calyx.*	*Number of applications.*	*Total number of apples*	*Number wormy July 20th.*	*Per cent wormy.*	*Number wormy when gathered.*	*Per cent wormy.*	*Per cent sound.*
Grimes' Golden	Open	1, 2, 3, 4	190	1	.5†	4	2.†	98
Grimes' Golden	Open	1, 2, 3, 4	238	0	0.	11	4.6	95
Grimes' Golden	Open	1, 2, 3, 4	815	0	0.	18	2.†	98
White Pippin	Open	1, 2, 3, 4	715	1	.14	36	5.	95
White Pippin	Open	1, 2, 3, 4	500	1	2.	23	4.5	95
White Pippin	Open	1, 2, 3, 4	200	0	0.	57	28.5	71
Shiawasse	Open	1, 2, 3, 4	365	0	0.	35	10.	90
Shiawasse	Open	1, 2, 3, 4	360	0	0.	9	2.5	97
Shiawasse	Open	1, 2	135	0	0.	53	10.	60
Whitney's 20	Open	1, 2, 3, 4	825	5	.6	17	2.	98
Whitney's 20	Open	1, 2, 3, 4	425	2	.5	0		
Fall Jenneting	Open	0	525	13	2.5	107	20.	80
Fall Jenneting	Open	2, 3, 4	450	2	.5	34	7.5	92
Fall Jenneting	Open	2, 3, 4	570	2	.35	27	5.	95
Fallawater	Open	1, 2, 3, 4	53	0	0.	7	13.	87
Pumpkin Russet	Open	1, 2, 3, 4	150	9	.6	16	10.	90
Pumpkin Russet	Open	1, 2, 3, 4	295	0	0.	33	11.	89
Pumpkin Russet	Open	1, 2, 3, 4	125	1	8.	10	8.	92
Rambo	Open	1, 2, 3, 4	275	1	.3†			
Rambo	Open	1, 2, 3, 4	310	0	0.			
Rambo	Open	1, 2, 3, 4	325	1	.3			
Wallbridge	Open	1, 2, 3, 4	295	0	0.	0	0.	100
Wallbridge	Open	1, 2, 3, 4	100	0	0.	2	.5	99.5
Wallbridge	Open	1, 2, 3, 4	152	2	1.3	0	0.	100
Wolf River	Open	1, 2, 3, 4	112	3	3.	2	2.	98
Wolf River	Open	1, 2, 3, 4	185	2	1.†	0	0.	100
Wolf River	Open	1, 2, 3, 4	286	3	1.	0	0.	100
Wolf River	Open	1, 2, 3, 4	200	1	.5	0	0.	100
Wolf River	Open	1, 2, 3, 4	100	2	2.	0	0.	100
Yellow Transparent	Open	1, 2, 3, 4	575	8	1.4	0	0.	100
Soulard	Open	1, 2, 3, 4	285	9	3.2	2	1.	99
Red Astrachan	Open	1, 2, 3, 4	88	1	1.2			
Oldenburg	Open	0	336	0	0.	73	22.—	88
Oldenburg	Open	2, 3, 4	475	1	.2	0	0.	100
Oldenburg	Open	1, 2, 3, 4	160	4	2.5	0	0.	100
Oldenburg	Open	1, 2, 3, 4	50	5	10.			
Oldenburg	Open	1, 2, 3, 4	137	6	4.4	20	14.5	85.5

TABLE SHOWING RELATIVE EFFECTS OF EARLY AND LATE SPRAYING IN 1898—Concluded.

Variety.	*Condition of calyx.*	*Number of applications.*	*Total number of apples.*	*Number wormy July 20th.*	*Per cent wormy.*	*Number wormy when gathered.*	*Per cent wormy.*	*Per cent sound.*
May	Open	1, 2, 3, 4	122	0	0.	0	0.	100
May	Open	1, 2, 3, 4	105	1	1.	6	6.	94
May	Open	1, 2, 3, 4	155	0	0.	0	0.	100
Delaware	Open	1, 2, 3, 4	100	0	0.	10	10.	90
Delaware	Open	1, 2, 3, 4	135	1	.7	2	1.5	98
McMahan's White	Open	1, 2, 3, 4	345	1	.3	18	5.2	95
McMahan's White	Open	1, 2, 3, 4	297	3	1.	27	10.	90
McMahan's White	Open	1, 2, 3, 4	253	0	0.	21	8.	92
Scott's Winter	Closed	0	627	15	2.3	105	16.	84
Scott's Winter	Closed	2, 3, 4	285	2	.7	35	12.	88
Scott's Winter	Closed	2, 3, 4	385	4	1.	25	6.5	93.5
Summer Queen	Open	1, 2, 3, 4	120	0	0.			
Summer Queen	Open	1, 2, 3, 4	180	0	0.	0	0.	100
Summer Queen	Open	1, 2, 3, 4	195	1	.5	0	0.	100
Bailey Sweet	Open	1, 2, 3, 4	58	0	0.	0	0.	100
Bailey Sweet	Open	1, 2, 3, 4	175	0	0.	0	0.	100
Colvert	Open	1, 2, 3, 4	175	0	0.	7	4.	96
Colvert	Open	1, 2, 3, 4	350	0	0.	0	0.	100
Colvert	Open	1, 2, 3, 4	14	0	0.	0	0.	100
Gano	Open	1, 2, 3, 4	295	0	0.			
Gano	Open	1, 2, 3, 4	300	2	.7			
Gano	Open	1, 2, 3, 4	350	3	1.			
Salome	Open	1, 2, 3, 4	30	0	0.	8	25.	75
Salome	Open	1, 2, 3, 4	125	0	0.	35	25.	75
Pewaukee	Closed	1, 2, 3, 4	250	2	8.	10	4.	96
Pewaukee	Closed	1, 2, 3, 4	225	3	1.3	7	3.	97
Pewaukee	Closed	1, 2, 3, 4	50	0	0.	2	4.	96
Jewett's Red	Closed	1, 2, 3, 4	150	1	.7	12	8.	92
Jewett's Red	Closed	1, 2, 3, 4	175	0	0.	15	9.	91
Jewett's Red	Closed	1, 2, 3, 4	400	0	0.	8	2.	98
Pryor's Red	Open	1, 2, 3, 4	500	1	2.	9	2.	98
Pryor's Red	Open	1, 2, 3, 4	750	0	0.	6	8.	99
Pryor's Red	Open	0	800	20	2.5	87	23.†	77
Mann	Open	2, 3, 4	175	2	1.	6	3.	97
Early Strawberry	Closed	1, 2, 3, 4	210	1	.5	3	1.5	98.5
York Imperial	Closed	1, 2, 3, 4	175	1	.5	13	7.5	92.5
York Imperial	Closed	1, 2, 3, 4	560	2	.3	16	2.5	97.5
Twenty-Ounce	Closed	1, 2, 3, 4	50	2	4.			
Ortley	Closed	1, 2, 3, 4	75	0	0.	4	5.	95
Ortley	Closed	1, 2, 3, 4	200	0	0.	12	6.	94
Taylor's Red	Open	1, 2, 3, 4	80	0	0.	2	2.5	97.5
Longfellow	Open	1, 2	620	1	.2	106	16.†	84
Maiden's Blush	Closed	0	125	0	0.	76	60.	40
Maiden's Blush	Closed	2, 3	150	1	.7	57	38.	62
Saint Lawrence	Closed	2, 3, 4	450	0	0.	15	3.†	97

From the above table several interesting facts may be deduced.

(1) Of the twenty-nine thousand nine hundred and fifty-eight apples produced on the eighty-four trees less than one (.6-|-) per cent was wormy July 20, and but little more than five per cent was infested when the fruit was gathered. The injury varied from nothing on certain sprayed trees to sixty per cent on one not sprayed.

(2) The five check trees which were not sprayed produced two thousand four hundred and thirteen apples, of which twenty-three per cent were wormy.

(3) Two trees received only the first and second applications. They produced seven hundred and eighty-five apples, of which twenty per cent were injured by the apple worm.

(4) One tree received the second and the third applications, the first and the fourth being omitted. This tree produced one hundred and fifty apples, of which thirty-eight per cent were infested.

(5) From seven trees only the first spraying was omitted. On these trees less than five per cent of the two thousand four hundred and five apples produced were wormy.

(6) Sixty-nine trees received all four applications, and but slightly more than three per cent of the sixteen thousand eight hundred and twenty apples produced were wormy.

(7) Perhaps the most striking fact brought out, and the one that probably explains the poor results from the early applications, is the extremely small percentage of injury that had occurred up to July 20. On only one tree did it amount to as much as four per cent. Even on the trees not sprayed, the average loss up to that time, was less than two per cent.

(8) The results of the one season's experiments indicate that the first application was valueless, that the second and possibly the third were nearly so, and that the fourth was the important one. That late applications are important have been verified by our later experience and by the results obtained by fruit growers; but the inefficiency of the early applications should not be considered as proved, even for the Willamette valley without further evidence, although the results obtained taken in connection with the fact that the larvae do not begin to infest the fruit much before July 1, at least indicate their lack of value for this locality. In dryer and warmer parts of the state, where the fruit is attacked earlier, the first applications are of undoubted value.

The results of the season's work indicate very clearly the great value of the fourth application. Nevertheless, the experiments were not entirely satisfactory. The college orchard, being an experimental one, contains a large number of varieties of but two or three trees each. While this was perhaps of value in showing the comparative effect of the sprays on the different varieties, it made it impossible to obtain a sufficient number of trees of the same variety on which to test the relative value of the different applications under like conditions. It was also unfortunate that some of the trees selected as checks failed to set fruit. Thus it is that the results from making the first and second applications, only, were obtained on but two trees, and those from the second and third applications, only, were obtained on but one. The value of these early applications therefore cannot be considered as satisfactorily proved or disproved.

In the spring of 1899 an attempt was made to repeat the experiments under more favorable conditions, by entering into an arrangement for cooperative work in the orchard of Mr. Thos. Whitehorn. The orchard is conveniently located and consists principally of but two varieties of apples, the Newtown Pippin and the Ben Davis. The apple crop for this season being an almost entire failure, similar arrangements were made for the season of 1900 for cooperative work in Mr. Whitehorn's orchard and in a small orchard of Baldwins controlled by Mr. B. F. Irvine. These orchards were each sprayed four times, for codling moth, with Bordeaux

mixture and Paris green. The first application was made May 7 to 14; the second June 22 to 27; the third July 26 to 28; the fourth August 31 to September 1. In addition, the Ben Davis trees which had been sprayed June 23, were re-sprayed June 27, on account of a heavy shower having fallen on June 24.

In each of these orchards certain rows or trees were left untreated at each spraying that we might again test the comparative value of the different applications. Owing to an oversight, however, notes on the amount of injury were not taken until the fruit had been gathered, when it was found impossible to satisfactorily separate the various lots according to the applications they had received. While it was, therefore, impossible to compare the value of the different sprayings, the results are not without value, since they give added proof of the value of spraying in general. Although they obtained an additional spraying on June 27, the poorest results were obtained with the Ben Davis of which approximately thirty per cent were wormy. The Newtown Pippins, standing beside them in the same orchard, were almost entirely free from codling moth injury—not over two per cent being infested. In the Baldwin orchard the injury did not exceed one or two per cent. In fact, Mr. Irvine reported that "in several hundred bushels less than half a dozen apples affected with worm were found. In a few trees, a few rods distant from the others, which were not sprayed, the fruit was so wormy that it was unfit to use. None of it was gathered."

It should be remembered that the above work was experimental. Its object was to test the value of late applications of arsenicals for the codling moth and incidentally to determine the least number of applications that would give satisfactory results. Although we obtained good results by spraying only four times, orchardists generally will undoubtedly get better results by making five or six applications. The habits of the moth vary with the year and with the locality to such an extent that it is impossible to give definite instructions as to when these applications should be made. For the present or until further experiments shall have proved its efficiency or inefficiency we shall continued to advise that the first applications be made within a week after the petals fall and before the calyx lobes close. Each grower must determine for himself when the other application must be made. The idea should be to keep the fruit thoroughly coated with poison from the time the very first eggs can be detected on the apple in the spring until the middle of September. Every worm that gets into the calyx or through the skin of the apple before the poison is applied is beyond its reach and the chances are that it will pass through its transformations and multiply fifty or a hundred fold in the next generation. Every apple grower, then, should learn to recognize the eggs of the codling moth and should start his spray pump as soon as they are detected. If he will not take the trouble to become acquainted with them the pump should be started at the earliest possible moment after the first indications of the presence of the worm in the fruit can be detected, and thereafter the orchard should be sprayed every two or three weeks during the season. In case a heavy shower follows any application the

orchard should be at once resprayed. By a thorough study of the habits of the moth in his locality one can learn to vary the length of the periods between the different applications so that the fruit will be most thoroughly coated, with poison at the times that egg laying is most active. Thus at Corvallis, I have found that for the first brood this is between June 20 to 25 and July 10 to 15, and for the second brood from about August 10 to September 15. We shall, therefore, in the future, take particular pains to keep the fruit thoroughly covered during these two periods.

The methods of successful spraying are so well described in the two articles in the appendix—one by Hon. E. L. Smith, a successful fruit grower and president of the State Board of Horticulture, the other by Hon. John D. Olwell, one of the most extensive and successful apple growers in the state, and the first grower in the state to use a power spraying outfit. Both of these men have had extensive experience with spraying that pays and whatever advice they give can be safely followed in their respective localities. It will be noted that Mr. Smith uses the arsenite of lime,* prepared after a slightly modified Kedzie† formula, while Mr. Olwell uses a mixture of Paris green and London purple. I have principally used Paris green. So far as efficiency is concerned it probably makes little or no difference which of these poisons is used. The arsenite of lime is cheaper than the other two and is more easily held in suspension. It is extensively used at Hood River, and has given general satisfaction. Paris green and London purple are too well known to require any further notice than to say that the former is more uniform in the amount of arsenious acid it contains than is the latter, and whenever the two have been carefully tested side by side has invariably given better results.

It will also be observed that both Mr. Smith and Mr. Olwell apply the poison in a mixture of lime and water. In the Willamette valley and along the coast, it should be applied in Bordeaux mixture for all sprayings after the petals fall and previous to July 1. First, because the Bordeaux is necessary to control the apple scab and other fungous diseases; second, because it causes the poison to adhere to the fruit better than does any other substance. After July 1, it is best to use the lime and poison only, as the Bordeaux is not necessary and stains the fruit. To successfully combat both apple scab and codling moth, it is advised to spray with plain Bordeaux just as the leaf buds are unfolding, and again just as the blossoms begin to open. Within a week after the petals fall the trees should be sprayed with Bordeaux to which one of the above poisons has been added, the same amount of poison being used as when it is applied in water. So far as codling moth is concerned, no other applications are necessary in the Willamette valley until well toward the end of June when

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* Sometimes termed arsenite of soda.

† First recommended by Dr. R. C. Kedzie, of the Michigan Agricultural College. The arsenic and sal soda are boiled together until a clear solution of arsenite of soda is formed. This is exceedingly injurious to foliage. It therefore must always be applied in lime water or in Bordeaux with an excess of lime since the lime precipitates the arsenic as insoluble arsenite of lime, thereby neutralizing its injurious action. In case the arsenic does not all become precipitated injury to foliage may occur.

the first eggs are deposited, but if it is desired to fight the scab fungus, as well, the orchard should be again sprayed with Bordeaux in ten days or two weeks after the application last mentioned. The poison may also be added to the Bordeaux for this application to kill any leaf-eating insects that may be present. In spraying for apple scab, the idea should be to keep every part of the tree thoroughly protected by Bordeaux from the time the leaves first appear until the spring rains are over. The number and frequency of the applications will necessarily vary with the amount of rainfall. Likewise, in spraying for the codling moth, the idea should be to have every part of every apple coated with poison from the time the first eggs hatch until the fruit is nearly ready to gather. It is not necessary to add poison to the Bordeaux before the petals fall, nor is it necessary to use Bordeaux with the poison after July 1. Between these dates the two should be used together, one pound of Paris green being added to each two hundred gallons of Bordeaux. (Arsenite of lime or the Paris green-London purple mixture can of course be used in place of the Paris green.)

We have usually obtained better results from Bordeaux mixture by using more lime iu its preparation than is commonly recommended. To make fifty gallons of Bordeaux, dissolve six pounds of copper sulphate in twenty-five gallons of water. Slowly slake six to eight pounds of lime (air-slaked lime must not be used) and add enough water to make twenty-five gallons. Then slowly pour the two diluted mixtures together. If much spraying is to be done time can be saved by preparing stock solutions of the copper sulphate and the lime, as follows: Weigh out one hundred pounds of copper sulphate, put it in a coarse sack and hang it near the top in a fifty-gallon cask. Fill the cask with water and allow to stand until the bluestone is all dissolved. Then refill the cask to the fifty-gallon mark. Each gallon of the solution will thus contain two pounds of the copper sulphate. In another fifty-gallon cask slowly slake one hundred pounds of lime, after which add enough water to make fifty gallons. Each gallon will therefore contain two pounds of lime. To prepare fifty gallons of Bordeaux misture, dilute three gallons of the sulphate of copper solution with twenty-two gallons of water. Likewise, dilute three to four gallons of the milk of lime with enough water to make twenty-five gallons. Then pour the two diluted solutions together. Under no conditions should the undiluted stock solutions be mixed.

OTHER PREVENTIVE MEASURES.

Spraying has come to be the chief means of protecting fruit from injury by the codling moth. In this state it is now practically the only means employed. If it be done intelligently and be persisted in, and if a good quality of poison be used, the result should be at least eighty-five to ninety-five per cent of fruit free from worms. Nevertheless, one should not overlook the facts that smooth trees and clean cultivation are efficient supplements to spraying; that if sheep or hogs are allowed to run in the orchard, they will devour the fallen fruit with many worms included; that

SPRAYING BY GASOLINE POWER IN ORCHARD OF OLWELL BROS.,
CENTRAL POINT, OREGON.

closed screens at the windows and doors of storerooms in which infested fruit has been kept, means imprisonment for life to all moths that emerge therein in spring. Some good authorities also recommend that the old "banding system" be used as a supplement to spraying. This consists in folding a piece of thick, dark colored cloth to make bands four to six inches wide and fastening these tightly about the trunk of each tree about two feet above the ground. This simply furnishes the larvae convenient places in which to pupate. After the first brood larvae begin to leave the fruit these bands should be examined every six to eight days until about September 15, and all the insects killed. Further examination of the bands can then be deferred until sometime after the fruit has all been gathered, when they should again be gone over and all the hibernating larvae killed. The expense of banding is hardly necessary if the spraying has been carefully and intelligently done.

SPRAYING.

By Hon. E. L. Smith.

The spray pump might well be adopted as the emblem of the fruit grower, and on it inscribed that old legend, "By this sign we conquer."

If there is any considerable fruit-growing section independent of its use, it is unknown to me and thorough spraying has become one of the most essential factors in successful orcharding.

The subject being one of prime importance, and as many discouraging results have been reported, it may be well to compare experiences and inform ourselves as to those conditions that will insure success.

My own experience has demonstrated that these conditions are substantially as follows:

First, the material must be unadulterated and of regulation strength. Lime forms a part of many spraying compounds and its efficiency is greatly lessened if it becomes air slaked before using. I have frequently been asked as to the relative merits of Paris green and the arsenite of soda, for codling moth. I believe they are equally effective if properly prepared and applied.

Second, the spraying must be begun at the proper time and continued at regular intervals. For the apple moth, for the best results, spray fruit as soon as petals have fallen, and then at regular intervals of two weeks to middle of September.

I am aware that so eminent an authority as Professor Slingerland holds that subsequent sprayings after the first two are useless. His idea is that the calyx of the apple being cup shaped will hold sufficient poison to kill the young larvae, but that we cannot coat the sides of the apple with a sufficient amount to be effective.

I cannot concur in this conclusion. The calyx of many varieties of apples never closes and I believe it is well to renew the poison that may have been dissipated at the eye of the apple. Again the moth lays many

eggs on the upper surface of the leaves and may we not coat these leaves and even the fruit itself with such an amount of poison-bearing lime as to afford a very uncomfortable diet for the newly-born larvae. An opinion has obtained among many growers that the lime itself if not an insecticide is at least a deterrent and for that reason we use from six to eight pounds freshly slaked to fifty gallons of spray.

Late sprayings are important from the fact that the moth is never so much in evidence as between the 15th day of August and the 15th day of September.

Third, the spraying must be done thoroughly to secure best results. From my point of observation, on the top of the spray-tank, I find that there is a tendency to slight the center and the highest branches of the trees by the men who guide the nozzles. Again story-telling on the part of the sprayers does not work well in my orchard; their entire attention must be centered on their work, and thoroughness ceases when talking begins.

I repeat that the cardinal principles of successful spraying are materials of full strength, carefully compounded and applied at the right time, in a thorough manner.

I do not hesitate to say that failures or partial failures are usually on account of non-compliance with these indispensable conditions. If the orchard is a large one a power-pump is of great utility. There are several kinds of these pumps in use, the most effective in my opinion being those run by small engines, usually gasoline.

These engines afford a constant, and any desired power, agitate the liquid thoroughly, which is especially necessary when Paris green is used as it is not soluble in water, and force the spray between the leaves and into the clusters of apples far better than can be done with the hand-pump. The engine, however, must be covered to protect it from the flying spray, adds much to the weight of the load and requires a man with some knowledge of mechanics to keep it in order.

During the past season I used what is styled "The Orchard Monarch," manufactured by the Field Force Pump Company of Lockport, New York. This machine is operated by a crank shaft and sprocket-gear attached to the hind wheels of the wagon. In driving from tree to tree the pressure is pumped up automatically and at the same time the power pump forces the liquid from the tank holding one hundred and fifty gallons into a chamber of twelve gallons capacity.

The objection I have found to this machine is that when the team stops and the spray is turned on the pressure falls rapidly and that it will not generate sufficient power in going from tree to tree, planted twenty-four to thirty feet apart, and has to be assisted by a hand pump conveniently placed near the driver. In a five-year-old orchard I was able to do excellent work, using two double Vermorel nozzles, without stopping the team, covering seventeen acres easily in a day. On the whole I do not regret the purchase of the Orchard Monarch, as it saves a great amount of hand pumping. I conclude, however, that we have not yet

reached the acme in power-spraying, and look forward confidently to the time when we will do our pumping with the light but powerful storage battery, the latest and most important of all Mr. Edison's inventions, as he declares.

Hood River apple growers, so far as I know with a single exception, use the arsenite of soda application for the moth and are using a greater proportion of white arsenic than in former years and without injury to foliage.

The past season I followed this formula:

Water	1 gallon
White arsenic	1 pound
Sal soda	2 pounds

Boil fifteen minutes or until the liquid is clear. Add an amount of water equal to that evaporated, making one full gallon of arsenite, and use one and one-half pints to fifty gallons of water to which has been added six pounds of fresh slaked lime. This spray has been used for the past four years with average results of ninety to ninety-five per cent of fruit free from the moth.

In Southern Oregon equally favorable results are obtained, using Paris green and London purple. In Missouri quite a number favor a dry powder claiming that it is easier and more rapidly applied. If you want to test it make a powder composed of ten pounds lime, one pound Paris green, one pound Bordeaux, and apply with a powder-gun when the dew is on the leaves.

I deduce some conclusions from the past season's spraying.

Two years ago in a young orchard four years old there was so little fruit that I did not spray it—result, fifty boxes of apples, fully one-half damaged by codling moth. Sprayed same orchard six times last season and gathered over five hundred boxes of fruit. Examined critically fourteen boxes of Grimes' Golden Pippins and found but five wormy apples, the rest in about the same proportion, as near as I could judge. It is safe to say that ninety-nine per cent were not wormy. In a neighbor's young orchard not more than twenty rods distant, no spraying was done; result, over a hundred boxes, nearly three-fourths ruined by the codling moth.

I conclude from these facts that an orchard can be kept free from the apple moth, even when it is adjacent to other orchards where it abounds. In an older orchard did not fare so well. Ben Davis fully one-fourth wormy. The Ben Davis grows in clusters and so closely that the liquid cannot be forced between apples and the moth improved the opportunity.

I have two hundred Salome trees which bore too great a harvest in 1900; last year so few that I did not think it would pay to spray them; estimated that there would be fifteen bushels on these trees. After gathering my main crop thought I would pick these Salomes, but on examination found scarcely an apple that the moth had not penetrated. Sprayed the adjacent rows and got ninety per cent clean fruit.

I conclude from this experience that spraying pays. That it is almost impossible to save apples growing in clusters like the Ben Davis and that the codling moth is deficient in taste, so far as this variety is concerned.

I frequently found that when an apple rested on a limb, there was the moth between the limb and the apple. To secure best results the apple must be so exposed that spray-liquid can reach every portion of it.

METHOD OF SPRAYING FOR THE CODLING MOTH.

By Hon. John D. Olwell.

The demand is always for the best. If the fruit-grower wants a demand for the product of his orchard, he must produce the best. He must defend his orchard against all pests that prey on trees; and this is accomplished by the intelligent use of the spray pump. To do thorough and successful work, the hand spray pump must be abandoned, relegated to the past, like the sickle, the cradle, the flail, and other machinery of primitive days. The gasoline spray machine has come to stay; it is one of the greatest factors in the growing of fruit. It has practically revolutionized spraying, being economical, rapid, and thorough. One team hauls the engine, pump and tank of water of one hundred and twenty gallons capacity. One team and man, with water tank on his wagon, hauls water to the spraying tank—the water is transferred to the spraying tank in a moment by a pump attached to and run by the engine. The agitator on the spraying tank is geared by a bevel wheel, and run by a small shaft and pinion, and the poison is at all times kept in solution. Great care is exercised in procuring good poison, always getting that which is free from raw arsenic as much as possible. As a rule, this is not an easy task, as many adulterated brands are on the market. We procure samples and submit them to microscopic tests, and usually no difficulty is experienced in detecting the spurious article. The quality of the poison being assured, our next step is to go to work.

The proportions of poisons are as follows: Five ounces of Paris green and four ounces of London purple. We fill many small paper bags and have them in readiness for the season's work. We take one of the nine-ounce bags of combined poisons to one hundred and twenty gallons of water—the amount contained in the supply tank. Before putting the poison in the tank, it is mixed in a small amount of water, to form a paste, and in that way it is thoroughly blended. It is then poured through a fine sieve and strained into the supply tank, which has previously been filled with water. We then take a half gallon of puttycoat of lime, made from best fresh lime, and mix it with water until it is very thin. This is also strained into the supply tank. The straining of the lime water is for the purpose of keeping all grit that is in the lime out of the tank, that would clog the valves and cut the lining of the pump. The lime is added to neutralize the effects of the poison on the foliage of the trees. The poison is ready and spraying commences. The early brood of moths appears about the time of the opening of the apple blossom when the

female deposits her eggs in the calyx just as the apple is forming; in a short time the egg hatches and the worm begins its damage. The first spraying to be effective must occur before the calyx of the apple closes and before the egg hatches; otherwise the poison cannot destroy the worm.

The bloom being well off the trees, vigorous spraying with the gasoline spray pump enables us to go over our orchard of one hundred and sixty acres in ten days. Should a rain occur immediately after spraying, we spray again at once. Should we have no rain for the three weeks, we then spray once again; and every three weeks during the season we cover the trees with their coat of poison. Again the gasoline spray pump is a power, in that rapid work is accomplished. In the spring when it is necessary to spray for the first deposits, the period is very short between the falling of the bloom and the closing of the calyx, and it is impossible to thoroughly spray a large orchard with hand pumps.

Then we have the spring rains to combat. If our first spraying has been effective, we do not notice much damage until the broods of August and September appear. The orchard may be sprayed in the spring and early summer, and be free from the worm to the beginning of August, and if neglected for the rest of the year, a great amount of fruit is destroyed. As a rule our success in spraying has been in going over the trees for the last spraying the first or second week in September.

Good returns follow well directed efforts. Four good rules are:

First—Be sure your poison is good.

Second—Thoroughly agitate, as Paris green will settle to the bottom of the tank like sand, and your work is lost.

Third—Apply the poison at the proper time.

Fourth—See that your work is thorough and success is yours.

CONCLUSIONS.

The codling moth is our most serious apple pest.

It is likely to be a serious pest wherever the apple can be successfully grown. Apple-growing regions now free from it are not likely to long remain so.

The average percentage of fruit injured by the codling moth is not greater in Oregon than in other apple-growing regions.

There are but two annual broods—not three or four, as has been stated. Owing to irregularity of development these broods overlap so that larvae may be found in fruit from the time the first wormy apples occur in spring until after the fruit is gathered.

In the Willamette Valley, there appears to be no relation between the blossoming of the apple trees and the time at which the moths appear.

The eggs are deposited principally on the surface of the fruit and not in the calyx. At Corvallis egg-laying does not begin until towards the end of June. It probably does not occur when the evening temperature falls much below sixty degrees, and is probably most active when such temperature is above seventy-five to eighty degrees.

Probably a considerable number of larvae pupate under clods and rubbish on the ground.

Birds are the most effective natural aids in controlling the codling moth. No benefit is to be expected from the introduction of foreign birds or from artificial use of fungous and bacterial diseases.

Spraying with one of the arsenites is the most practical method of protecting fruit from the codling moth. It is not only practical but necessary to spray for the second brood. Persistent, intelligent spraying should give eighty-five to ninety per cent of fruit free from worms. Our best orchardists do even better.

Clean, smooth trees, clean cultivation, sheep or hogs in the orchard, screens over the doors and windows of storerooms, and banding the trees are efficient supplements to spraying.

EXPERIMENTS WITH INSECTICIDES FOR THE SAN JOSE SCALE.

By Prof. S. A. Forbes, State Entomologist, Urbana, Ills.

The "California wash" of lime, sulphur, and salt, and the "Oregon wash" of lime, sulphur, and blue vitriol have been for many years the general reliance of the fruit growers of the Pacific Coast for protection against the San Jose scale. In a letter to me, dated October 22, 1901, Prof. C. W. Woodworth, of the entomological department of the University of California, said that "the lime, salt, and sulphur mixture is the sole dependence in this state for killing the San Jose scale"; and under the same date Prof. A. B. Cordley, of the entomological department of the Oregon Agricultural College and experiment station, wrote: "With us the lime, salt, and sulphur compound is a very satisfactory remedy for the San Jose scale, and is used very extensively. In fact, this and the lime, sulphur, and blue vitriol compound are practically the only ones used for winter sprays for this insect." As early as 1889 the California wash was the only winter remedy recommended for the San Jose scale by the secretary of the state board of horticulture, in the annual report of the board for that year; and in 1896 Prof. John B. Smith, state entomologist of New Jersey, who visited California for a special study of the San Jose scale and its treatment there, found the lime salt, and sulphur mixture one of the "favorite insecticides" for that scale in California and on the Pacific Coast generally.*

The introduction of these insecticides in the East has been long delayed, probably owing in large measure to unfavorable reports of experiments made in the Atlantic states. In articles published in Bulletin 3 of the United States division of entomology, issued in 1896, and in Bulletin 30 of the same series, 1901, p. 34, the reported failure of the California

* Rep. Ent. Dept. N. J. Agr. Exper. Station, 1896, p. 551.

wash in the East is attributed to the frequent occurrence of rains shortly after the insecticide had been applied, and chemical testimony is brought forward in support of this supposition.

USE OF CALIFORNIA AND OREGON WASHES IN ILLINOIS.

In the fall of 1901, when an appropriation of $15,000 for insecticide work on the San Jose scale became available to my office, I was embarrassed by the fact that no effective insecticide previously used by us had been found free from serious liability to injure the more tender fruit trees, or at least their fruiting buds. The peach and the plum were especially liable to serious damage by both the kerosene sprays and the whale-oil soap solution, the first being injurious to the tree, and the second very commonly destructive to the fruit buds and, of course, to the crop of the following year. At this time I received from Professor Cordley, of Oregon, the above-mentioned letter, in which he suggested that I should give the lime, sulphur, and salt compound a thorough test in Illinois, and further said that in Oregon, where this mixture is thoroughly effective, the climate is as moist during the winter—when the spray is principally used—as in any part of the East. I had additional testimony to the same effect from a former student and assistant of mine, Mr. Fred McElfresh, who informed me, after a year's experience in entomological work at the Oregon Agricultural College, that the weather of Western Oregon is very similar to that of the greater part of Illinois.

Under these conditions I decided last fall to use the lime, salt, and sulphur mixture, standard in the Pacific states, for all our Illinois insecticide work on the peach and plum, preferring to take the risk of a possible inefficiency of the insecticide rather than the much greater one of serious injury to the orchard tree. The season seemed favorable to the treatment and highly encouraging reports came in from the field throughout the entire winter up to early March. At this time, in order to secure more precise and comprehensive information as to the value of the Oregon and California washes, I detailed one of my office assistants, Mr. E. S. G. Titus, to carry out a series of experiments with them under various conditions, and sent him to Sumerfield, in St. Clair county, where he remained for three weeks, supervising the treatment of the trees, and making counts of scales and other observations of the results.

SECONDARY RESULTS OF THE EXPERIMENTS.

It was the principal object of these experiments to test the effects of rains on the two washes used, but other important results appeared in the outcome besides those immediately aimed at. Counts of dead and living scales on the check trees not treated and on the experimental trees before treatment, showed a surprising percentage of half-grown scales already dead, the ratio of dead young to living scales varying on different trees and on different parts of the same tree from twenty-one per cent to sixty-nine per cent. This fact had already been observed in other lo-

calities where our insecticide work was in progress, and had, indeed, been noticed and reported as early as 1898 by another assistant of the office, Mr. E. B. Forbes, engaged in distributing to infested trees in southern Illinois the spores of a fungus parasite of the San Jose scale.

This spontaneous death of many of the scales which might have been expected to pass the winter alive, was apparently due in great measure and in both instances to a severe drouth of the preceding year. Consistently with this explanation the dead scales were most abundant on trees worst affected by the drouth, and on parts of trees to which the flow of sap would naturally be least.

Another observation of importance to the investigator was made with reference to the action of the insecticide in loosening the scales of the insects killed by it. In most cases where the application took fatal effect the scales were so far loosened from the bark that they were easily rubbed off, and might be washed away in large numbers by an ordinary rain. As a consequence, if counts were made of dead and living scales upon a tree before treatment, and again after a treatment and after a heavy rain had fallen, the ratio of living to dead might be as great in the latter case as in the former. It will be seen that by overlooking this circumstance an investigator might easily be led to very erroneous conclusions as to the effects of moisture on the insecticide.

GENERAL FEATURES OF THE EXPERIMENTS.

The actual effect of rains was experimentally ascertained by heavily spraying the trees with water at selected intervals after treatment with the wash, and by making careful counts of dead and living scales in each case and comparing the ratios so arrived at with those found in the beginning. The trees sprayed with each mixture were treated exactly alike except as to the subsequent application of water, and in this latter respect the different trees received very different treatment. Some, for example, were watered but once, and that the next day after the application of the insecticide wash; and others were watered daily for the seven days next following it. In order to avoid interference with the experiments by rains, which fell three times during the fortnight covered by the greater part of the experiments, some of the trees were covered by canvas tents at night and whenever rain threatened.

GENERAL STATEMENT OF RESULTS.

Details of all forms and variations of the experiments will be given further on, but it is sufficient for this general statement to say that the general average result of a single spraying of twenty trees with lime, sulphur, and salt was the destruction of ninety and six-tenths per cent of the scales when no water was applied within five days and of eighty-six per cent when water was used. The corresponding result of the application of lime, sulphur, and blue vitriol to fifteen trees was the destruction of ninety-three per cent of the scales without water, and ninety-two and two-tenths per cent when water was applied within the first five days.

PERIOD AND METHODS OF THE EXPERIMENTS.

The experiments on which the above statement rests may be conveniently described in five lots: two with lime, sulphur, and blue vitriol; two with lime sulphur and salt; and one, a special experiment, with both these washes on trees covered by tents. Two of the four experiments above mentioned—one with the California wash and one with the Oregon wash—were begun March 3, and the other two (in which also both washes were used) were begun March 5. The tent experiment was begun on the 21st of the month. Observations on all the lots treated were continued until March 25; that is, twenty-two days for the first two lots, twenty days for the third and fourth, and five days for the lot under tents. The experiments consisted of a single application of the insecticide in every case, with varying subsequent treatments of the different trees with water. Frequent counts of dead and living scales were made for all of the trees, no attention being paid in these counts to old scales, outworn and dead, but only to those whose size and immature character showed that they belonged to the new generation of the preceding fall. Counts of dead and living scales were made in all cases either before or shortly after the application of the insecticide spray. It was in this way ascertained that an average of about fifty per cent of the immature scales were already dead on these trees before the insecticide was applied; and that the action of the insecticide was scarcely perceptible within the first twenty-four hours.

EXPERIMENTAL TREES USED.

Forty-three trees were used in all the experiments, twenty-five of them apple trees and eighteen peach. They varied in height from twelve to eighteen feet; in spread of top from eight to twenty feet; and in diameter of trunk from four to nine inches. The average height was fourteen feet, and the average spread thirteen. The general condition of these trees varied from "very poor" to "excellent" six of them being described as "very poor," eight, as "poor," sixteen, as "fair," ten, as "good," and three, as "excellent." Some of the peach trees were more than half dead, and many of them in such a condition that the owners were about to remove them. The dry weather of the preceding summer had killed the young growth even on otherwise healthy trees, and in some cases much of the older wood had also died from drouth. All the trees were of course, infested with the San Jose scale, eighteen of them badly so, and the others to a medium degree.

WEATHER OF THE PERIOD.

The weather of the experimental period was the ordinary variable weather of an Illinois March, the temperature at seven o'clock a. m. ranging from eighteen degrees F., on the eighteenth, to fifty-four degrees on the fifteenth, and at noon, from thirty-four degrees on the eighteenth, to eighty-eight degrees on the twenty-fifth. There was an unusual amount of wind from the southeast—on not less than fourteen days out of the

twenty-two. Rain fell on six days, and a light snow on one other. The first rain, on March 7, lasted for two and a half hours but was very light —about two gallons for each experimental tree, according to Mr. Titus's estimate. The temperature at the time was fifty-six degrees. On the ninth day after the beginning of the first experiment (March 11) the weather was showery, with heavy mist most of the day, the temperature sixty degrees to sixty-four degrees; and on the thirteenth day (March 15) a heavy shower of rain fell, with hail, for an hour in the afternoon, amounting to ten or twelve gallons to the tree. The seventeenth and eighteenth were cold—twenty-six degrees in the morning and twenty-four degrees at noon on the seventeenth, and eighteen degrees in the morning and twenty-four degrees at noon on the eighteenth. The wind blew strong and cold from the northwest, with a light snow on the first of these days. A slow drizzling rain fell on the twentieth, beginning at about five in the afternoon and continuing through the night and all the following day.

The insecticide sprays were applied on the third, the fifth, and the twentieth. March 3 was a partly cloudy day, with a cold raw wind from the east and northeast, the thermometer registering thirty degrees at seven a. m. and forty degrees at noon. The fifth was a clear day, with a northwest wind, fairly strong, the thermometer thirty degrees at seven a. m. and forty-five degrees at noon. On the twentieth the wind was from the southeast, with a threat of storm which resulted in rain at five o'clock in the afternoon. The temperature was thirty-four degrees at seven a. m. and fifty-seven degrees at noon.

PREPARATION OF THE INSECTICIDES.

The insecticide washes were prepared in substantially the same manner. For the California wash, fifteen pounds of stone lime were slaked in a little very hot water, fifteen pounds of ground sulphur being slowly poured in during the slaking process with constant stirring of the mixture. This was then boiled for an hour, after which fifteen pounds of salt were added and the boiling continued for fifteen minutes longer. The whole was then poured into a barrel through a strainer, and enough boiling water was added to make fifty gallons. In the preparation of the Oregon wash a pound and a quarter of blue vitriol was used instead of the salt, the crystals of the blue vitriol being dissolved in hot water and the solution added slowly to the slaking lime. The apparatus used was a Morrill and Morley pump, with twenty-five feet of hose and a twelve-foot extension rod with a double Vermorel nozzle.

THE WATER SPRAYS TO TEST EFFECT OF RAINS.

In wetting down the trees to imitate the effects of rain, fifteen gallons of water were used to a tree, as a rule, a double amount being occasionally applied as a variation of the experiment. For a tree of the average spread of thirteen feet, fifteen gallons of water was equivalent to a rainfall of a sixth of an inch, amounting to a sharp summer shower. The washing and leaching effect of the application was, however, greater than that

of a corresponding shower, since the water spray was not distributed equally over the whole area covered by the tree top, but was made to wet the tree equally in all parts; the middle part of the tree much more freely, consequently, than the outer parts. It would doubtless be fair to say that the fifteen-gallon portion was equivalent in effect on the average experimental tree to a rainfall of a third of an inch, and the double portion, of course, to twice that amount. The time taken for the application of fifteen gallons varied, according to the weather and the size of the tree, from twenty minutes to thirty or thirty-five, and for the thirty-gallon application it was never less than an hour. The water in all cases dripped freely from the trees for some time after spraying ceased, carrying with it so much of the insecticide in solution that the drip was of about the color of the original mixture.

The applications of water were varied systematically as to number, to frequency, and to period of time between the insecticide operation and the first general wetting. Tree No. 1, for example, was wet every day for a week, commencing the next day after the California wash was applied; tree No. 2 was wet but once, and that the day after insecticide treatment; tree No. 3, was sprayed on the third with the California wash, and with water on the sixth and every other day thereafter for three days; tree No. 6, was sprayed but once, and then with thirty gallons of water one week after insecticide treatment; and tree No. 9, the same, except that the water was applied at the end of two weeks. Further particulars may be obtained from the detailed accounts of the experiments.

EXPLANATION OF TABLES.

The four tables in the text have been prepared to present in summary form the detailed results of the treatment for each tree as shown by successive counts of scales on selected sample twigs and branches. Against the number of each tree is placed for each date on which special observations were made, the number of scales counted and the percentage of scales killed by the insecticide up to that time. The first count shows always the percentage of scales found alive at the time of treatment. The last column in each table shows the final effect of treatment in the form of a general average of all the percentages of scales killed, excluding only the first seven days subsequent to the insecticide treatment. At the bottom of each table is a series of data for the entire lot of trees, corresponding in form to those given in the body of the table for each tree.

EXPERIMENTAL DETAILS.

First Lot of Trees. California Wash.

Nine apple trees sprayed with lime, sulphur, and salt on the third day of March. Weather partly cloudy, with cold raw wind from the east-northeast; temperature, thirty degrees at seven a. m. and forty degrees at noon.

Dead and living scales were first counted on these trees the following day, March 4. Although the fact was not known at the time, it became apparent later by comparison of percentages of scales on these trees with those found on check trees and on other lots counted before insecticide treatment that no discoverable effect of the insecticide had been produced at the time this first count was made. If any scale insects had been killed so soon, their appearance had not yet sufficiently changed to indicate the fact. The percentages found on this first day are, consequently, to be taken as indicating the ratio, before treatment, of dead and living scales among the young of the preceding year. One thousand three hundred and fifty such scales were counted in all, and fifty-two per cent of these were alive, forty-eight per cent having died from unknown causes, in most cases probably from drouth.

In determining the effect of the insecticide under the varying conditions supplied, this first count of living scales was made the starting point for the calculation of the percentages of scales killed; that is, if only fifty per cent of the scales were found alive at the beginning of the experiment, the destruction of scales by the insecticide was figured on this fifty per cent, those dead in the beginning being, of course, ignored. Counts were made upon carefully selected specimen twigs or branches, the number counted each time varying from one hundred to four hundred, and the totals for each tree, from three hundred to one thousand three hundred and fifty. The total number of scales counted from tnis lot on nine trees was nine thousand.

The effect of the insecticide was only gradually made manifest, and was, as a rule, not fully produced until about the tenth day, although the difference between the final result and that apparent at the end of the first week was really but small. Consequently, in describing the different features of the experiment, the average of the counts after the first week will be taken to express the final effect of the insecticide in destroying the San Jose scale.

As these various trees were treated subsequent to the insecticide spray by an application of various amounts of water at different intervals, it will be necessary to discuss each tree separately.

LOT I. SPRAYED WITH LIME, SULPHUR, AND SALT, MARCH 3.

Trees.	Scales.	Mar. 4.	Mar. 6.	Mar. 8.	Mar. 9.	Mar. 10.	Mar. 15.	Mar. 18.	Mar. 20	Mar. 22.	Mar. 25.	Mar. 28.	Mar. 10-15.
1	No. counted	150	200	400		300	200			200	350	300	1350
	Per cent alive	40											
	Per cent killed		75	84		83	74			74	78	85	79
2	No. counted	150	100				100			100	300	100	600
	Per cent alive	37											
	Per cent killed		78				86			95	87	92	90
3	No. counted	200	150			150	100	150				100	500
	Per cent alive	29											
	Per cent killed		53			79	89	88				72	78
5	No. counted	150			150		300		150			100	550
	Per cent alive	47											
	Per cent killed				80		90		91			94	92
6	No. counted	150			150		150					150	300
	Per cent alive	64											
	Per cent killed				84		86					86	86
7	No. counted	150		150		200	150					150	500
	Per cent alive	68											
	Per cent killed			80		83	89					92	88
8	No. counted	100	100					150		150		150	450
	Per cent alive	54											
	Per cent killed		54					90		84		91	88
9	No. counted	150		300			200	150	300			150	800
	Per cent alive	56											
	Per cent killed			83			87	85	89			94	89
10	No. counted	150	150		150		200		250			150	600
	Per cent alive	69											
	Per cent killed		77		95		99		95			92	95
Totals	No. counted	1350	700	850	450	650	1400	450	700	450	650	1350	5650
	Per cent alive	52											
	Per cent killed		67	82	86	82	87	88	92	85	83	88	86

Tree No. 1.—A tree sixteen feet high, with a nine-inch trunk and a twenty-foot top; in fair general condition, but badly infested with the San Jose scale. After insecticide treatment March 3, sprayed with fifteen gallons of water daily for seven days, from March 4 to 10 inclusive: a total application of one hundred and five gallons, equal to about half an inch of rainfall over the whole area beneath the tree top. Rains falling, as above described, added about fifteen gallons of water to this amount.

Forty per cent of the young scales of the preceding year were alive on this tree when the treatment began. Three days after, seventy-five per cent of these had been killed, and five days after, eighty-four per cent. The samples taken on the twelfth and nineteenth days showed an extraordinary percentage of living scales—twenty-six per cent on each day—and the average final ratio of scales killed stands at seventy-nine per cent.

Tree No. 2.—A sixteen-foot tree, with a nine-inch trunk and an eighteen-foot top; in fair general condition, but badly infested with the

scale. Treated with water but once, and that on March 4, the day succeeding the application of the insecticide spray. Rainfall of course followed on the seventh, eleventh, and fifteenth, as on all other trees of this experiment, amounting to about fifteen gallons of water additional. Thirty-seven per cent of the scales alive at the time of treatment; seventy-eight per cent of these dead three days after, and eighty-six per cent dead on the twelfth day. The final general effect was the killing of ninety per cent of the scales.

Tree No. 3.—An eighteen-foot tree, with an eight-inch trunk and a thirteen-foot top; in good general condition, but badly infested. Water treatment three days after the insecticide application, and twice on alternate days thereafter, making forty-five gallons of water thus applied. Twenty-nine per cent of the scales alive when the treatment began; fifty-three per cent of these dead on the third day, and seventy-nine per cent on the seventh; the average final destruction of scales, seventy-eight per cent.

Tree No. 5.—A fifteen-foot tree, with an eight-inch trunk and an eleven-foot top; in poor condition, badly infested. Sprayed with fifteen gallons of water five days after treatment, and again two days later. Forty-seven per cent of the scales alive in the beginning; eighty per cent of these killed by the sixth day, when the first count was made, and ninety per cent by the twelfth; average final effect of the treatment, the destruction of ninety-two per cent of the scales.

Tree No. 6.—A fifteen-foot tree, with an eight-inch trunk and a twelve-foot top; in poor condition, moderately infested by the San Jose scale. Treated but once with water, and this on the seventh day after the insecticide spray, when thirty gallons were applied. Sixty-four per cent of the scales alive in the beginning; eighty-four per cent of these dead by the sixth day and eighty-six per cent by the twelfth; average ratio of scales finally killed, eighty-six per cent.

Tree No. 7.—An eighteen-foot tree with an eight-inch trunk and a ten-foot top; in poor general condition, moderately infested by the scale. Fifteen gallons of water on the thirteenth day after insecticide treatment, and another fifteen gallons on the fourteenth; before this, only the rainfalls already described. This tree and all the remaining trees of this lot were practically check trees with regard to the effects of the water sprays, since these were applied after the full effect of the insecticide must have been produced. Sixty-eight per cent of the scales alive in the beginning; eighty per cent of these dead on the fifth day and eighty-three per cent on the seventh; ratio finally killed, eighty-eight per cent.

Tree No. 8.—Seventeen feet high, with an eight-inch trunk and a twelve-foot top; in fair general condition, but badly infested with the scale. But one application of water, and that fifteen gallons on the fourteenth day after insecticide treatment. Fifty-four per cent of scales alive in the beginning, and fifty-four per cent of these dead on the third day; ninety per cent dead on the sample representing the fifteenth day, with an average of eighty-eight per cent destroyed as the final effect of the insecticide.

Tree No. 9.—A sixteen-foot tree, with an eight-inch trunk and an eleven-foot top: in fair condition, but badly infested. No water (except rains) until the fourteenth day, when thirty gallons were applied. Fifty-six per cent of the scales alive in the beginning; eighty-three per cent of these dead on the fifth day, and eighty-seven per cent on the twelfth; average final effect, eighty-nine per cent destroyed.

Tree No. 10.—A fifteen-foot tree, with a seven-inch trunk and thirteen-foot top; in fair condition, moderately infested. No water was applied to this tree, and the effect of the insecticide was modified only by the natural rainfall already referred to. Sixty-nine per cent of the scales alive in the beginning; seventy-seven per cent of these dead on the third day and ninety-five per cent on the sixth, with a final average result of ninety-five per cent destroyed.

Taking the entire group of nine trees together, without reference to differences of treatment subsequent to the insecticide spray, it appears that an average of fifty-two per cent of the scales were alive in the beginning; that sixty-seven per cent of these were dead by the third day, eighty-two per cent by the fifth, and eighty-six per cent by the sixth; and that the final average effect of the treatment was the destruction of eighty-six per cent.

Second Lot of Trees. California Wash.

Nine trees, partly apple and partly peach, sprayed with lime, sulphur, and salt on the fifth of March. Weather clear, with fairly strong northwest wind; temperature, thirty degrees at seven a. m., and forty-five degrees at noon. In this case the dead and living scales were counted on sample twigs and branches from a part of the trees just before the application of the insecticide, and from another part on the following day. The ratios of dead to living scales were practically identical in these two lots, thus showing, as has been already remarked, that scales killed the first day, if any, do not sufficiently change in appearance within that time to suggest the fact. Subsequent counts of scales were made for this lot on eleven later dates, the number counted, as before, ranging from one hundred to four hundred, and amounting for the lot to ten thousand five hundred specimens.

Tree No. 4.—An apple tree, sixteen feet high, with a nine-inch trunk and a twelve-foot top; in fair condition, but badly infested by the scale. This tree received but one water treatment, and that on the seventh of March, two days after the insecticide application and on the same day as the first light fall of rain. Fifteen gallons were applied, and approximately two gallons must be added for the rainfall. Scales alive in the beginning, forty-two per cent; eighty-three per cent of these killed on the sample for the fifth day, with an average of seventy-eight per cent as the final effect of the insecticide.

LOT II. SPRAYED WITH LIME, SULPHUR, AND SALT, MARCH 5.

Trees.	Scales.	Mar. 5.	Mar. 7.	Mar. 9.	Mar. 10.	Mar. 15.	Mar. 18.	Mar. 20.	Mar. 21.	Mar. 22.	Mar. 23.	Mar. 24.	Mar. 25.	Mar. 19-25.
4	No. counted	100			200	400				200			250	850
	Per cent alive	42												
	Per cent killed				83	87				80			68	78
20	No. counted	200					150						100	250
	Per cent alive	47												
	Per cent killed						92						98	95
27	No. counted	200		150	300			250					200	450
	Per cent alive	36												
	Per cent killed			62	80			78					88	83
29	No. counted	200		200		200		200			200		150	750
	Per cent alive	42												
	Per cent killed			80		92		87			98		93	93
31	No. counted	300		200	100			250					200	450
	Per cent alive	37												
	Per cent killed			78	83			92					78	85
32	No. counted	300		300		300			200		200		300	1000
	Per cent alive	44												
	Per cent killed			69		86			79		89		87	85
33	No. counted	300		200		300				200			300	800
	Per cent alive	45												
	Per cent killed			70		80				87			95	87
35	No. counted	200	200		200		300		300			200	300	1100
	Per cent alive	38												
	Per cent killed		62		90		90		99			91	97	94
36	No. counted	200	300		200		200					200	200	600
	Per cent alive	51												
	Per cent killed		51		85		97					94	99	99
Totals	No. counted	2000	500	1050	1000	1200	650	700	500	400	400	400	2000	6250
	Per cent alive	42												
	Per cent killed		56	71	84	86	93	86	88	84	94	93	89	89

Tree No. 20.—A peach tree, twelve feet high, with a six-inch trunk and a nine-foot spread of top; in very poor condition, though but moderately infested by the scale. No water except the natural rainfall. Forty-seven per cent of the scales were alive in the beginning; ninety-two per cent of these were dead on the thirteenth day, when the first subsequent count was made, and ninety-eight per cent on the sample for the twentieth day, the final average effect being reckoned at ninety-five per cent destroyed.

Tree No. 27.—An apple tree, fifteen feet high, with an eight-inch trunk and a seventeen-foot top; in good condition, moderately infested with the scale. This tree was sprayed with water but once, and that five days after the insecticide application. Thirty-six per cent of the scales were alive in the beginning; sixty-two per cent of these were dead on the fourth day and eighty per cent on the fifth, the average final effect being reckoned at eighty-three per cent destroyed.

Tree No. 29.—An apple tree, twelve feet high, with a seven-inch trunk and a fifteen-foot top; in bad condition, and heavily infested. Twice treated with water, once on the fifth day after the insecticide spray and

once on the tenth, in each case with fifteen gallons. Forty-two per cent of the scales alive at the beginning of the experiment; eighty per cent of these dead on the fourth day and ninety-two per cent on the tenth day; the average final effect, the destruction of ninety-three per cent of the scales.

Tree No. 31.—An apple tree, twelve feet high, with an eight-inch trunk and a nineteen-foot top; in good general condition, and moderately infested by the scale. Once treated with thirty gallons of water, on the next day after the application of the insecticide spray. Thirty-seven per cent of the scales were alive in the beginning; seventy-eight per cent of these were dead on the fourth day and eighty-three per cent on the fifth; the final average effect of the insecticide, eighty-five per cent destroyed.

Tree No. 32.—A peach tree, twelve feet high, with a six-inch trunk and a nine-foot top; in fair general condition, but heavily infested. Treated with fifteen gallons of water a day for three days in succession, beginning the next day after the insecticide spray was applied. The second of these treatments coincided with the first day's rain. Forty-four per cent of living scales at the beginning; sixty-nine per cent of these dead on the fourth day and eighty-six per cent on the tenth, according to the sample for that day; the final average effect, the destruction of eighty-five per cent.

Tree No. 33.—A peach tree, nine feet high, with a three-inch trunk and an eight-foot top; in good condition, moderately infested by the scale. Sprayed twice in succession with fifteen gallons a day, following immediately upon the insecticide treatment, the second application coinciding with the first day's rain. Forty-five per cent of the scales alive at the start; seventy per cent of these dead on the fourth day, and eighty per cent on the tenth; final average effect, the destruction of eighty-seven per cent of the scales.

Tree No. 35.—A peach tree fifteen feet high, with five-inch trunk and a twelve-foot top; in poor condition, and moderately infested by the scale. Treated but once with water, and that on the tenth day after the experiment began, this treatment coinciding with the third day's rain. Thirty-eight per cent of the scales alive at the time of the application of the insecticide; sixty-two per cent of these dead on the second day and ninety per cent on the fifth, with an average final destruction of ninety-four per cent of the scales.

Tree No. 36.—A peach tree, fifteen feet high, with a six-inch trunk and an eight-foot top; in poor condition, and heavily infested. Treated with water twice, once on the day following the insecticide treatment and once on the tenth day of the experiment, the last treatment coinciding with the third day of rain. Fifty-one per cent of the scales alive in the beginning, and fifty-one per cent of these dead on the second day after insecticide treatment; eighty-five per cent dead on the fifth day, with a final average destruction of ninety-seven per cent of the scales.

Taking this group of nine trees as a whole and averaging all statements concerning them, it appears that forty-two per cent of the scales were alive when the experiment began; that fifty-six per cent of these had been killed by the treatment by the second day thereafter, seventy-one per cent by the fourth and eighty-four per cent by the fifth; and that the final average effect was approximately eighty-nine per cent destroyed.

To this lot it will be convenient to add for discussion two other trees sprayed with lime, sulphur, and salt on the seventh of March, which, it will be remembered, was the day of the first rainfall occurring in the experimental period. These trees received no water treatment, but were intended as checks on the other experiments.

Tree No. 38.—The first of these was a peach tree, nine feet high, with a five-inch trunk and a ten-foot top. It was in excellent condition, and only moderately infested. Thirty-eight per cent of the scales were alive on the day preceding the insecticide application, and on the day following the treatment thirty-one per cent of these were dead. No other count was made upon this tree until the eleventh day, when ninety-six per cent appeared to have been killed. The final general effect was an average of eighty-nine per cent of the scales destroyed.

Tree No. 39.—The second tree of this pair was also a peach tree, about nine feet high, with a five-inch trunk and a ten-foot top. It was in excellent general condition, and moderately infested. Only twenty-seven per cent of the scales were alive when the experiment began; twenty-nine per cent of these were dead by the second day after treatment, and eighty-four per cent by the third day; and the general final effect averaged ninety-one per cent of the scales destroyed.

GENERAL RESULTS OF EXPERIMENTS WITH LIME, SULPHUR, AND SALT.

An analysis of the data contained in the above descriptions of Lots 1 and 2 and in the tables of percentages for those lots enables us to distinguish two groups of trees; those which received some treatment of water within five days after the insecticide application, and those which, if treated with water at all, did not receive it until the principal effect of the insecticide had already been produced. There are eleven trees in the first group, namely, 1, 2, 3, 4, 5, 27, 29, 31, 32, 33, and 36, and nine trees in the second, namely, 6, 7, 8, 9, 10, 20, 35, 38, and 39.

The average final effect of the insecticide upon the nine trees of the second group was the destruction of ninety and six-tenths per cent of the scales, and the corresponding destruction on the eleven trees of the first group was eighty-six and one-tenth per cent, making a difference of four and five-tenth per cent due to the action of water on the insecticide when applied within five days after the original treatment. In other words and more generally stated, it may be said that in these experiments the effect of thoroughly watering the treated tree during the first five days after the experiment began, was to diminish the destructive effect of the insecticide by approximately five per cent.

If, regardless of this difference, we take these twenty trees as a group, we find that forty-eight per cent of the young scales of the preceding year were dead when the experiment began; and that forty-three per cent of these were killed by the second day after treatment, sixty per cent by the third, eighty-four per cent by the fifth, and eighty-six per cent by the sixth. The average effect of the insecticide, as shown by counts made from the seventh to the twenty-second day, amounted to eighty-eight and four-tenths per cent; or, if we include only the counts from the tenth to the twenty-second day, it stands at eighty-nine per cent.

LOT III. SPRAYED WITH LIME, SULPHUR, AND BLUE VITRIOL, MARCH 3.

Trees.	Scales.	Mar. 4.	Mar. 6.	Mar. 8.	Mar. 9.	Mar. 10.	Mar. 15.	Mar. 18.	Mar. 20.	Mar. 22.	Mar. 23.	Mar. 25.	Mar. 10-25.
11	No. counted	300	300			150	150		150		250	150	850
	Per cent alive	67											
	Per cent killed		85			93	93		92		88	98	93
12	No. counted	300	300			250	300		250			200	1000
	Per cent alive	66											
	Per cent killed		85			93	96		95			95	95
13	No. counted	200				250	250	350			300	300	1450
	Per cent alive	57											
	Per cent killed					89	94	95			96	98	94
14	No. counted	300		150		150			200		100	150	600
	Per cent alive	49											
	Per cent killed			83		96			93		84	96	92
15	No. counted	300		150		200	150	100				250	700
	Per cent alive	61											
	Per cent killed			87		80	81	97				98	89
16	No. counted	300		300			300		300		400	300	1300
	Per cent alive	48											
	Per cent killed			81			92		93		94	95	93
17	No. counted	300	200		150		300		150			150	600
	Per cent alive	41											
	Per cent killed		68		76		95		90			99	95
Totals	No. counted	2100	800	600	150	1000	1450	450	1050		1050	1500	6500
	Per cent alive	56											
	Per cent killed		79	84	76	90	92	96	93		90	97	93

Third Lot of Trees. Oregon Wash.

This lot of experimental trees corresponds to the first in all particulars except that the Oregon wash of lime, sulphur, and blue vitriol was used as an insecticide instead of the California wash, and that the experiment was made with seven trees instead of nine. The variations in treatment omitted in this lot correspond to those of Nos. 5 and 7 of Lot 1. All were apple trees, growing in the same orchard as those of the first lot.

Tree No. 11.—An eighteen-foot tree, with an eight-inch trunk and a twelve-foot spread; in excellent condition, and moderately infested. Sprayed with fifteen gallons of water daily for seven days, beginning March 4, the next day after insecticide treatment. Sixty-seven per cent of the scales alive at the beginning of the experiment; eighty-five per

cent of these dead on the third day and ninety-three per cent on the seventh; the average final effect of the insecticide, the destruction of ninety-three per cent of the scales. Comparison with No. 1—similarly treated except that the California wash was used—shows a difference of fourteen per cent of the scales finally killed, in favor of the Oregon wash.

Tree No. 12.—A fifteen-foot tree, with an eight-inch trunk and a twelve-foot top; in fair condition, moderately infested with the scale. Sprayed but once, with fifteen gallons of water, on the day following the insecticide treatment. Sixty-six per cent of the scales alive in the beginning; eighty-five per cent of these dead by the third day; ninety-three per cent by the seventh, and ninety-six per cent by the sample, on the twelfth; the average final effect, the destruction of ninety-five per cent. Comparison with No. 2, the corresponding specimen of Lot 1, gives a difference in favor of the Oregon wash amounting to five per cent of scales finally killed.

Tree No. 13.—A twelve-foot tree, with a six-inch trunk and a thirteen-foot top; in good condition, and but moderately infested. Sprayed with water three times, beginning March 6, with intervals of one day between applications, the first rainfall coming between the first and second sprayings. Fifty-seven per cent of the scales alive in the beginning; eighty-nine per cent of these dead on the seventh day, when the first subsequent count was made, and ninety-four per cent on the twelfth; general average effect, the destruction of ninety-four per cent. On the companion tree, No. 3 of the first lot, an average final destruction of seventy-eight per cent, making a difference of sixteen per cent in favor of the Oregon wash.

Tree No. 14.—This tree was thirteen feet high, with a six-inch trunk and a sixteen-foot top. It was in good condition but badly infested by the scale. It was treated but once with water, thirty gallons being applied seven days after the insecticide, agreeing in this respect with No. 6 of Lot 1. Forty-nine per cent of the scales were alive in the beginning. Eighty-three per cent of these had been killed by the fifth day, and, according to the sample count made, ninety-six per cent by the seventh day. Owing, however, to a low ratio in the hundred-scales count on the twentieth day, the final effect stands at ninety-two per cent of the scales destroyed. The corresponding ratio for No. 6 was eighty-six per cent—a difference of six per cent, in this case, in favor of the Oregon wash.

Tree No. 15.——A thirteen-foot tree, with a six-inch trunk and an eighteen-foot top; in fair condition, but badly infested by the scale. This tree received no treatment with water until March 17, when fifteen gallons were applied—fourteen days after the application of the insecticide. Tree No. 8 of Lot 1 is the companion tree. Sixty-one per cent of the scales on No. 15 were alive in the beginning; eighty-seven per cent of these were dead on the fifth day; and the final average stands at eighty-nine per cent. This agrees practically with the average for No. 8, which was eighty-eight per cent.

Tree No. 16.—A fifteen-foot tree, with an eight-inch trunk and a fifteen-foot top; in fair condition, but badly infested. This tree received no water treatment until the fourteenth day, when thirty gallons were applied. Forty-eight per cent of the scales alive March 4; eighty-one per cent of these dead on the fifth day, and ninety-two per cent on the twelfth, with a general final average of ninety-three per cent destroyed. The corresponding tree of the other lot is No. 9, which shows a final average destruction of eighty-nine per cent.

LOT IV. SPRAYED WITH LIME, SULPHUR, AND BLUE VITRIOL, MARCH 5.

Trees.	Scales.	Mar. 5.	Mar. 7.	Mar. 9.	Mar. 10.	Mar. 15.	Mar. 18.	Mar. 20.	Mar. 21.	Mar. 22.	Mar. 23.	Mar. 24.	Mar. 25	Mar. 12-25.
18	No. counted	300	200	------	300	100	------	300	------	------	200	------	200	1100
	Per cent alive	47	------	------	------	------	------	------	------	------	------	------	------	------
	Per cent killed	------	15	------	83	89	------	87	------	------	91	------	87	88
21	No. counted	100	100	------	100	150	150	------	------	------	------	------	200	500
	Per cent alive	31	------	------	------	------	------	------	------	------	------	------	------	------
	Per cent killed	------	0	------	90	98	96	------	------	------	------	------	97	97
23	No. counted	300	------	300	------	------	200	------	------	300	------	------	300	800
	Per cent alive	49	------	------	------	------	------	------	------	------	------	------	------	------
	Per cent killed	------	------	65	------	------	88	------	------	92	------	------	88	89
24	No. counted	200	200	------	200	------	150	------	------	260	------	------	200	550
	Per cent alive	42	------	------	------	------	------	------	------	------	------	------	------	------
	Per cent killed	------	38	------	92	------	92	------	------	90	------	------	96	93
26	No. counted	300	200	200	200	------	------	300	------	------	300	------	200	800
	Per cent alive	33	------	------	------	------	------	------	------	------	------	------	------	------
	Per cent killed	------	35	68	81	------	------	93	------	------	97	------	87	92
28	No. counted	250	------	------	150	200	------	200	------	------	------	------	200	600
	Per cent alive	58	------	------	------	------	------	------	------	------	------	------	------	------
	Per cent killed	------	------	------	76	91	------	99	------	------	------	------	83	91
30	No. counted	200	------	------	300	------	200	------	200	------	300	------	300	1000
	Per cent alive	44	------	------	------	------	------	------	------	------	------	------	------	------
	Per cent killed	------	------	------	92	------	86	------	83	------	93	------	92	89
22	No. counted	300	------	------	300	------	300	------	200	------	150	------	200	850
	Per cent alive	44	------	------	------	------	------	------	------	------	------	------	------	------
	Per cent killed	------	------	------	88	------	90	------	98	------	94	------	98	95
Totals	No. counted	1950	700	500	1550	750	1000	800	400	500	950	------	1800	6200
	Per cent alive	44	------	------	------	------	------	------	------	------	------	------	------	------
	Per cent killed	------	22	66	86	93	90	93	91	91	94	------	91	91

Tree No. 17.—An eighteen-foot tree, with a nine-inch trunk and an eighteen-foot top; in poor condition, and badly infested. A check tree, receiving no water treatment, the effect of the insecticide being consequently modified only by the three rains described. Forty-one per cent of the scales alive in the beginning; sixty-eight per cent of these dead in three days, and ninety-five per cent in twelve, with a general average of ninety-five per cent finally destroyed. This, it will be noticed, is the same final average result as that of the companion experimental tree, No. 10.

Fourth Lot of Trees. Oregon Wash.

This lot is essentially a duplicate of Lot 2 except with respect to the insecticide treatment, which was identical with that of Lot 3, and also with respect to the number of trees made use of, which was eight in this lot and nine in Lot 2. All variations of experiments with Lot 2 are represented in Lot 4 with the exception of that for No. 29.

Tree No. 18.—A sixteen-foot apple tree, with a nine-inch trunk and a twenty-foot top; in fair general condition, but badly infested by the scale. Treated, like No. 4 of Lot 2, with a single application of fifteen gallons of water on the second day after the experiment, coinciding with the first shower of rain. Forty-seven per cent of the scales alive when the insecticide was applied; fifteen per cent of these dead on the second day, and eighty-three per cent on the fifth, with a final average destruction of eighty-eight per cent. The corresponding ratio for the companion tree, No. 4, was eighty per cent.

Tree No. 21.—A fifteen-foot peach tree, with an eight-inch trunk and an eighteen-foot top; in good condition, and but moderately infested. This received the same water treatment as No. 27 of Lot 3, namely, one application of fifteen gallons of water on the fifth day after the insecticide. Thirty-one per cent of the scales were alive in the beginning. None of them appeared to have been killed on the second day thereafter, but ninety per cent of these were dead on the fifth day, and ninety-eight per cent, according to the count made, five days thereafter. The general final average was ninety-seven per cent destroyed. The corresponding ratio for the companion tree, treated with the California wash, is eighty-two per cent.

Tree No. 22.—A peach tree, thirteen feet high, with a six-inch trunk and a twelve-foot spread; in poor condition, though but moderately infested. Treated but once, and that on the tenth day after the insecticide application, fifteen gallons of water being used. The corresponding tree of the second lot was No. 35. Forty-four per cent of the scales alive in the beginning; eighty-eight per cent of these dead on the fifth day, and ninety per cent on the thirteenth, with a final average ratio of ninety-five per cent destroyed; this to be compared with a ninety-four per cent average of the companion tree.

Tree No. 23.—A fifteen-foot apple tree, with an eight-inch trunk and a fifteen-foot top; in poor condition, moderately infested. This, like 32, treated with three daily water sprays of fifteen gallons each on three days immediately following the insecticide treatment—a duplicate in this respect of No. 32 of the second lot. Forty-nine per cent of the scales alive in the beginning; sixty-five per cent of these dead on the fourth day, and eighty-eight per cent on the thirteenth, with a final average destruction of eighty-nine per cent, that of the companion tree, treated with the California wash, being eighty-five per cent.

Tree No. 24.—A sixteen-foot peach tree, with a six-inch trunk and a nine-foot top; in fair condition, moderately infested. Treated on two

successive days immediately following the insecticide application with fifteen gallons of water on each day, the second of these treatments coinciding with the first day of rain. Forty-two per cent of the scales alive in the beginning; thirty-eight per cent of these dead on the second day, and ninety-two per cent on the fifth, the average final result being the destruction of ninety-three per cent of the scales—to be compared with eighty-seven per cent finally destroyed on the companion tree, No. 33, treated with the California wash.

Tree No. 26.—A twelve-foot peach tree, with a six-inch trunk and an eleven-foot top; in very poor condition though but moderately infested. Treated, like No. 36 of the second lot, with fifteen gallons of water on the day following the insecticide application, and another fifteen gallons on the ninth day thereafter, that is, the fifteenth day of March. This last treatment coincided with the third rainfall. Thirty-three per cent of the scales alive at first; thirty-five per cent of these dead on the second day, sixty-eight per cent on the fourth, eighty-four per cent on the fifth, and ninety-three per cent on the fifteenth—when the next succeeding count was made. A general final average of ninety-two per cent of the scales destroyed. The companion tree of the second lot gives a ratio of ninety-seven per cent finally killed.

Tree No. 28.—A fourteen-foot peach tree, with a five-inch trunk and a ten-foot top; in very poor condition, though but moderately infested with the scale. This tree was reserved as a check upon the experiment, without water treatment of any kind, comparing in this respect with No. 20 of Lot 2. Fifty-eight per cent of the scales were alive on it in the beginning; seventy-six per cent of these were dead on the fifth day, and ninety-one per cent on the tenth, the final average destroyed being ninety-one per cent. The corresponding ratio for the companion tree of the previous lot was ninety-five per cent.

Tree No. 30.—A twelve-foot apple tree, with an eight-inch trunk and a fourteen-foot top; in good condition, and but moderately infested. Treated but once, and that with thirty gallons of water on the next day after the application of the insecticide. Forty-four per cent of the scales alive in the beginning; ninety-two per cent of these found dead on the sample examined on the fifth day after treatment, the final average effect being the destruction of eighty-nine per cent of the scales. On tree No. 31, corresponding to this in the second lot, the average final ratio was eighty-four per cent destroyed.

COMPARISON OF VALUES OF OREGON AND CALIFORNIA WASHES.

Comparison of Lot 3 with the companion trees similarly treated in Lot 1 brings out very definitely the relative advantage of the Oregon wash. The general average of the ratios of final destruction is ninety-three per cent for the Oregon wash and eighty-seven per cent for the lime, sulphur, and salt. If we limit the comparison to the three pairs of trees which received the water treatment within the first five days after the application of the insecticide, that is, to Nos. 1, 2, and 3 of Lot 1, and

to 11, 12, and 13 of Lot 3, we find that in the latter ninety-four per cent of the scales were finally killed, and in the former only eighty-two per cent—an unmistakable indication that the Oregon wash was not at all affected in these experiments by water treatment; while the effect of the California wash was considerably reduced—a clear difference of twelve per cent of effectiveness in favor of the Oregon wash.

Comparing next the general averages of final effects shown by the ratios for corresponding trees of Lots 2 and 4, contrasting thus with respect to these two lots the advantages of the California and the Oregon wash, we find them to be as eighty-eight per cent and ninety-two per cent respectively—a difference of four per cent in final effect shown by this group of experiments in favor of the Oregon wash.

Bringing together the two lots representing each insecticide treatment and combining averages for the two insecticides as represented by the four lots of trees, it appears that ninety-two per cent of the scales were destroyed by the Oregon wash on fifteen trees as compared with eighty-seven per cent on fifteen trees identically treated after spraying with the California wash—a difference of five per cent in favor of the former treatment.*

THE TENT EXPERIMENT.

All the preceding experiments were intended to test the effect of artificial applications of water on the action of the two insecticides, these applications being made in a way to simulate the effects of rainfall. They were interfered with slightly by the three periods of light rain, the effects of which could not be clearly separated from those of the artificial treatment.

With a view to a test of the effects of rainfall, a small experiment was undertaken in which two trees—one treated with the California wash and the other with the Oregon wash—were covered with heavy canvas during the night and whenever rain threatened by day. Two other trees were similarly treated and left at all times exposed, and still two more, selected because of their close correspondence to the experimental trees were reserved without treatment, as checks. This experiment was begun March 20. The trees selected (the only ones remaining available) were peach trees on high ground and light soil, heavily infested, and in very poor condition. The drouth of the preceding season had affected them very seriously, the young wood being largely killed, and only twenty-nine per cent of the young scales on them being still alive.

The weather was favorable to the experiment. The insecticides were applied on the afternoon of March 20, and a slow fine rain began at five p. m. of the same day and continued until nine o'clock and for an unknown time into the night. Rain fell in a continuous drizzle, broken by

*The slight difference between this statement and the one on p. 153 is due to the fact that in the former certain trees treated with the California wash were included which were not exactly duplicated as to treatment by any of those treated with the Oregon wash.

showers, the whole of the following day, March 21, to an amount estimated by Mr. Titus at more than thirty gallons per tree.

The temperature of the twentieth was thirty-four degrees at seven a. m. and fifty-seven degrees at noon; that of the twenty-first was forty-four at seven a. m. and fifty-two at noon, the wind from the southeast both days. Observations on this experiment continued only until the twenty-fifth, but counts of the scales were made daily up to that time—three thousand scales for the four experimental trees, and two thousand and fifty for the two checks.

In this small experiment no differences of any significance were made out in the action of the insecticides, the total general effect being the destruction of approximately ninety-five per cent of the scales, and variations from this average in the individual trees being too slight to take into account. So far as any conclusion can be drawn from an experiment on so small a scale, we can only infer that a rainfall such as described, occurring at the time of the insecticide treatment, would have no appreciable effect on the action of either of the washes. The apparent extraordinary efficiency of the washes on these trees is plausibly explained by Mr. Titus, as connected with the poor condition of the trees and the probable consequent low vitality of such of the scale insects as remained alive.

EFFECTS OF RAIN AND WATER SPRAYS IN WASHING OFF DEAD SCALES.

Noticing that many scales were loosened and washed away after insecticide treatment of the trees, Mr. Titus made some careful counts from day to day of selected lots of scales on the experimental trees to determine the circumstances and the ratio of their diminution in numbers. Selecting, for example, a definite part of a branch, counting a hundred scales on it when the insecticide was applied and marking the area occupied by them, he counted them each day thereafter for several days and thus arrived at an exact conclusion as to the effect of the fluid applications and the incidental rains. Thus, on No. 1, three hundred scales counted March 3 were reduced to one hundred and eighty-eight by March 15—a loss of thirty-seven per cent. On No. 11, four hundred scales were reduced in the same time to two hundred and twenty-three—a loss of twenty-two per cent. Both these trees, it will be remembered, were sprayed with the insecticide March 3, and daily thereafter for one week with fifteen gallons of water. On No. 3, one hundred scales were reduced in eight days to seventy-two—a loss of twenty-eight per cent, this tree having been three times sprayed, with fifteen gallons of water each time. On No. 6, sprayed once with thirty gallons, the loss was twenty-five per cent in eight days; and on No. 14, receiving the same treatment except that the insecticide used was the Oregon instead of the California wash, the loss for the same period was eleven per cent. No. 21, sprayed also but once, with fifteen gallons of water, lost twenty per cent of its scales in seven days; No. 42, exposed to rains for a day and a night, lost in

five days eleven per cent of its scales; and No. 43, similiarly exposed, lost fifteen per cent.

The check trees 40 and 41, on the other hand, kept without treatment of any kind, lost within five days but four scales out of five hundred counted.

It was further apparent from observations made in the field that a brief but hard and dashing rain would detach many more scales than a light rain longer continued, and that a fine misty rain did not loosen the scales at all.

PRACTICAL CONCLUSIONS.

The foregoing described observations and experiments go to show that the Oregon wash of lime, sulphur, and blue vitriol, is a valuable insecticide for winter use in the climate of Illinois for the destruction of the San Jose scale; that its full effect will be produced in about a week; and that frequent short rains will not noticeably diminish or delay its action, even when they come within the first five days after the insecticide treatment. It is entirely harmless to any leafless tree, and hence may be freely used in winter (but in winter only) for all kinds of trees, shrubs, and vines.

The California wash of lime, sulphur, and salt, prepared as described previously, is a little less effective than the Oregon wash as a scale destroyer, and is considerably more likely to deteriorate after application if exposed to rains within the first few days. Otherwise its effects and characteristics are very similar to those of the Oregon wash.

It should be generally known that both these washes corrode brass and copper rapidly, and that consequently an iron pump may be used to better advantage in spraying them than one made in part of brass.

With respect to the comparative effectiveness of these washes and the better known whale-oil soap and coal-oil mixtures we have as yet no accurate knowledge. There is nothing to indicate, however, that the former are less effective here than on the Pacific Coast, where they seem to have been found very satisfactory in the hands of the ordinary orchardist for the destruction of the San Jose scale. Over both the latter applications they have the very great advantage that they are harmless to the tree, and that they do not endanger the crop of the following year. They are also decidedly cheaper than either the whale-oil soap or the kerosene emulsion. In our winter's work the cost of the materials for these various mixtures has been $1.12 per hundred gallons of the Oregon and the California washes; $2.80 per hundred gallons of kerosene emulsion, diluted to contain twenty per cent of kerosene; and $6.50 for the same quantity of the whale-oil soap solution, at the usual strength of two pounds to the gallon of water.

ADDITIONAL INSECTICIDE EXPERIMENTS FOR THE SAN JOSE SCALE.

By Prof. S. A. Forbes, State Entomologist, Urbana, Ills.

The last observations reported in bulletin 71 of the Illinois Agricultural Experiment Station were made March 25, at which time it now appears that the insecticide effect of the experimental applications made to trees infested by the San Jose scale was not yet complete, or at least not yet fully manifest. At the above mentioned date there were found on trees which had been treated with the Oregon and California washes twenty and twenty-two days previously, living scales in numbers varying from six to thirty-one per cent of those alive in the beginning for trees treated with the California wash and from one to seventeen per cent for those treated with the Oregon wash (see tables in bulletin 71).

A careful examination of these experimental trees, made by Mr. E. S. G. Titus May 12, and a systematic count of dead and living scales showed that by that time extremely few scales remained alive on any of these trees. Five hundred young scales of the preceding year were critically examined on each of eighteen hundred trees—nine thousand scales in all—care being taken to choose lots from all parts of the tree up to the terminal twigs. Of these nine thousand scales, only thirty-five were living, the ratio of living to dead varying from none at all to a maximum of one per cent—as near complete destruction as any field operation is likely to accomplish.

One half the trees on which these counts were made had been sprayed with the California wash and the other half with the Oregon wash; and sixteen of them were chosen in pairs such that the only difference between the treatment of the trees of each pair was the difference in the insecticide applied. Comparison shows that at the time these counts were made all the difference of effect between the two insecticides had disappeared, one proving finally as efficient as the other.

These eighteen trees were so selected as to represent ten variations of treatment with water, ranging from daily spraying for seven days in succession beginning with the next day after the insecticide treatment, to simple applications of water after an interval so long as to have practically no effect. On a comparison of the reports concerning the different lots of these trees, I find no evidence that variations with the water treatment made any difference with the final effect of the insecticide. The destruction of the insects was retarded in some cases by frequent and early wettings, as shown in bulletin 71, but was practically complete in every instance before May 12.

By those who have read bulletin 71 in will be remembered that large percentages of the young scales of the preceding year were dead at the beginning of the experiment in consequence apparently of the character of the weather of the preceding summer. If allowance is made for this fact and the ratio of living to dead scales is reckoned with refer-

ence to those alive when the experiment began, we find that the ratio of scales still living on these eighteen trees on the 12th of May varies from none at all for five of the trees to two and seven tenths per cent for one tree, the average ratio of living scales for the eighteen trees being a little less than eight tenths per cent.

In preparing bulletin 71 I had no data in hand for a comparison of the insecticide effects of the lime and sulphur washes with whale-oil soap or petroleum, but Mr. Titus's visit of May 12 enables me to make good this deficiency. All the infested trees at this place not used in the experiment had been sprayed with whale-oil soap in March by one of my regular field parties, and an examination of five thousand scales on eighteen of the trees so treated gave a total of thirty-nine scales, a little more than twice the ratio of living to dead scales found on those which had been treated with the lime and sulphur washes.

From the foregoing it appears that certain of the statements made in bulletin 71 must be modified with reference to these later and more complete results. It may be safely said that the washes applied were extremely efficient insecticides. Even such failures to kill the scales as occurred were probably due to imperfect distribution of the spray. The action of the washes is more prolonged than I have been previously led to infer, extending evidently beyond three weeks, and although at first considerable differences were noticeable between the Oregon and California washes, we must conclude from the above report that these are differences in promptness and rapidity of action rather than in the final effect. A similar statement may be made with reference to the effects of rain as represented by the application of water to our experimental trees. This clearly has the effect to delay, but not to prevent, a complete destruction of the scale, and it is apparent that these western washes, costing $1.12 per hundred gallons, are at least as destructive to insect life as the solution of whale-oil soap, costing $6.50 for the same quantity.

The following table will give some details of observation not reported in the text. The numbers used for the trees are the same as those in the tables of bulletin 71 and the experimental history of each tree can also be found in that bulletin. It is to be understood that five hundred scales were counted for each tree May 12. The first tree of each pair was sprayed with the California wash, and the second with the Oregon wash.

TABLE OF COMPARATIVE RESULTS.

Number of trees.	*Date of treatment.*	*Per cent alive when treated.*	*Per cent killed March 25.*	*Per cent killed May 12.*
1	March 3	40	79	100
11	" 3	67	93	98.8
2	" 3	37	90	98.9
12	" 3	66	95	99.4
3	" 3	29	78	98.6
13	" 3	57	94	98.9
6	" 3	64	86	100
14	" 3	49	92	99.6
9	" 3	56	89	99.6
16	" 3	48	93	99.6
10	" 3	69	95	99.4
28	" 5	58	91	98.6
4	" 5	42	78	100
18	" 5	47	88	98.3
30	" 5	44	89	100
31	" 5	37	85	97.3
36	" 5	51	87	100
24	" 5	42	93	99
Averages		50	89	99.2

OSWEGO STRAWBERRIES.

AN ACCOUNT OF EXPERIMENT WITH FERTILIZERS, AND RECORDS OF STRAWBERRY-GROWING, IN THE OSWEGO DISTRICT.

By PROF. L. H. BAILEY, Cornell Agricultural Experiment Station.

I. SUMMARY OF FIELD RESULTS WITH THE USE OF FERTILIZER ON STRAWBERRIES.

In the spring of 1897, at the request of the Oswego County Fruitgrowers' Association, the horticultural department of Cornell University planned, and now has under way, a series of tests with different fertilizers for the purpose of determining, if possible, the one best suited to the needs of the strawberry when grown as a field crop. These experiments were begun by the late E. G. Lodeman, and they have been continued under the personal supervision of C. E. Hunn.

The three essential fertilizers, nitrogen, phosphoric acid and potash, were used separately and in combinations in different weights and seasons, careful notes being taken both as to growth of plant and yield of fruit. The fertilizers were applied to young plantations in spring after the first tillage and before the plants bloomed, a year in advance of the recorded crop. The materials were scattered alongside the row, within a few inches of the plants, and were cultivated in. The plats were located on a variety of soils, ranging from typical strawberry soil, i. e., gravelly loam, through meadow land to black muck.

In 1897, in co-operation with the association, six plats, in as many different localities, were selected and a careful line of experiments was planned.

But five of these beds were continued through the year, the sixth having been disturbed by the digging of plants for sale. Tables 1 to 5, inclusive, give the results of the first year's work (1897).

The second year (1898) the plats were reduced to three in number, one on good strawberry soil, one on meadow land, and one on good wheat land. Tables 6 to 8, inclusive, give results of the second year's work. In 1899, no experiments were made. In 1897 and 1898, the plats were of various sizes, but in the tables below (Nos. 1 to 8) the fertilizers and yields are figured to the acre.

The third year (1900), in order to have all conditions as nearly perfect as possible, the department made arrangements to control a one-acre plat of strawberries in three different localities. With this area it was possible to have larger tests and to control cultivation. These plats are given as tables 9 to 11, inclusive.

Experiment No. 1 (1897).

Soil gravelly loam, two years from meadow. Season fairly dry.

Plat 1. Two hundred pounds wood ashes; yield, five thousand eight hundred and ninety-one quarts.

Plat 2. Four hundred pounds wood ashes; yield, six thousand five hundred and thirty-five quarts. (Plat 2 shows a gain of six hundred and forty-four quarts over plat 1. This at five cents per quart is an increase of $32.20, at an expenditure of $1.)

Plat 3. Three hundred pounds muriate potash; yield, six thousand six hundred and one quarts.

Plat 4. Six hundred pounds muriate potash; yield, seven thousand three hundred and ninety-three quarts.

Plat 5. Nine hundred pounds muriate potash; yield, eight thousand three hundred and eighty-three quarts. (Plat 5 shows, in comparison with plat 3 a money gain of $89.10 at five cents per quart, for an outlay of $12.50.)

Experiment No. 2 (1897).

Soil gravelly garden. Season fairly dry.

Plat 1. Five hundred pounds dissolved rock; yield, six thousand two hundred and twenty-seven quarts.

Plat 2. One thousand pounds dissolved rock; yield, seven thousand three hundred and twenty-two quarts. (Plat 2 shows a gain of one thousand and ninety-five quarts. At an expense of $10, an added value of $54.75 was secured.)

Plat 3. Five hundred pounds muriate potash; yield, six thousand nine hundred and nine quarts.

Plat 4. Two hundred and fifty pounds nitrate soda; yield, six thousand two hundred and eighty-nine quarts.

Plat 5. Two hundred and fifty pounds muriate potash, two hundred and fifty pounds nitrate soda; yield, seven thousand and ninety-four quarts. (Gain with potash and muriate together, eight hundred and five quarts; at five cents per quart, $40.25.)

Experiment No. 3 (1897).

Very stony, apparently deficient in humus. Season fairly dry.

Plat 1. Five hundred pounds muriate potash; yield, four thousand two hundred and eighty-six quarts.

Plat 2. Five hundred pounds sulfate potash; yield, four thousand and forty-four quarts.

Plat 3. Five hundred pounds dissolved rock; yield, five thousand five hundred and fifty-eight quarts.

Plat 4. Two hundred and fifty pounds muriate potash, two hundred and fifty pounds nitrate soda; yield, six thousand three hundred and thirteen quarts.

Plat 5. Two hundred and fifty pounds sulfate potash, two hundred and fifty pounds nitrate soda; yield, five thousand three hundred and fifty-seven quarts.

EXPERIMENT No. 4 (1897).

Soil rich bottom land. Season fairly dry.

Plat 1. Three hundred and fifty pounds dissolved rock; yield, thirteen thousand five hundred and ninety-seven quarts.

Plat 2. Seven hundred pounds dissolved rock; yield, twenty thousand and sixty-six quarts. (At an expense of $7, there was a gain of $353.55 over plat 1.)

EXPERIMENT No. 5 (1897).

Soil heavy muck which apparently contained sufficient nitrogen. Season fairly dry.

Plat 1. Three hundred pounds nitrate soda, three hundred pounds muriate potash, three hundred pounds dissolved rock; yield, seven thousand three hundred and eighty-two quarts.

Plat 2. Three hundred pounds muriate potash, three hundred pounds dissolved rock; yield, six thousand eight hundred and twenty-eight quarts.

Plat 3. Three hundred pounds nitrate soda, three hundred pounds dissolved rock; yield, six thousand one hundred and fifty-nine quarts.

Plat 4. Three hundred pounds nitrate soda, three hundred pounds muriate potash; yield, five thousand one hundred and fifty-six quarts.

Plat 5. Five hundred pounds nitrate soda, three hundred pounds muriate potash, three hundred pounds dissolved rock; yield, seven thousand and fifty-nine pounds.

Plat 6. Three hundred pounds nitrate soda, five hundred pounds muriate potash, three hundred pounds dissolved rock; yield, eight thousand seven hundred and eight quarts.

EXPERIMENT No. 6 (1898).

Soil gravelly loam. Season wet.

Plat 1. Six hundred and seventy-five pounds muriate potash; yield, five thousand four hundred and twenty-four quarts.

Plat 2. Six hundred and seventy-five pounds dissolved rock; yield, five thousand three hundred and twenty-six quarts.

Plat 3. Two hundred pounds nitrate soda, six hundred and seventy-five pounds muriate potash; yield, four thousand five hundred and eighty quarts.

EXPERIMENT No. 7 (1898).

Soil stony, but with sufficient humus. Season wet.

Plat 1. Five hundred pounds dissolved rock, three hundred pounds muriate potash; yield, six thousand nine hundred and twenty quarts.

Plat 2. Five hundred pounds dissolved rock, three hundred pounds sulfate potash; yield, six thousand seven hundred and eighty-nine quarts.

Plat 3. Four hundred pounds dissolved rock, four hundred pounds muriate potash; yield, seven thousand four hundred and eighteen quarts.

EXPERIMENT No. 8 (1898).

Soil good wheat land. Season wet.

Plat 1. Eight hundred pounds muriate potash, five hundred and seventy-five pounds nitrate soda; yield, four thousand four hundred and three quarts.

Plat 2. Eight hundred pounds sulfate potash; yield, four thousand and twenty-three quarts.

Plat 3. Check; yield. two thousand nine hundred and twenty-six quarts.

Plat 4. Eight hundred pounds dissolved rock, five hundred and seventy-five pounds nitrate soda; yield, three thousand five hundred and sixty-eight quarts.

Plat 5. Four hundred pounds dissolved rock, five hundred and seventy-five pounds nitrate soda; yield, three thousand two hundred and eighty-two quarts.

EXPERIMENT No. 9 (1899-1900).

One acre. Soil very poor and stony. Season very dry.

Plat 1. Manure, two thousand pounds ashes; yield, six hundred and fifty quarts.

Plat 2. Five thousand pounds ashes; yield, five hundred and forty quarts.

Plat 3. Check; yield, two hundred and eighty quarts.

Plat 4. One thousand pounds sulphate potash; yield, three hundred and fifty quarts.

Plat 7. One thousand pounds dissolved rock, manure; yield, nine hundred and ninety quarts.

Plat 8. Check; yield, one hundred and twenty quarts.

Plat 9. Two thousand pounds dissolved rock; yield, eight hundred and seventy quarts.

Plat 10. Two thousand pounds gypsum; yield, four hundred and thirty quarts.

EXPERIMENT No. 10 (1899-1900).

One acre. Soil very stony, but strong corn land. Season very dry.

Plat 1. Five thousand pounds ashes; yield, five thousand four hundred and seventy quarts.

Plat 2. Fifteen tons manure, two thousand pounds ashes; yield, five thousand three hundred and fifty quarts.

Plat 3. Check (no fertilizer); yield, two thousand six hundred and sixty quarts.

Plat 4. One thousand pounds sulfate potash; yield, two thousand nine hundred and seventy quarts.

Plat 5. One thousand pounds gypsum; yield, two thousand five hundred and ninety quarts.

Plat 6. One thousand pounds dissolved rock, one thousand pounds muriate potash; yield, three thousand nine hundred and seventy quarts.

Plat 7. Manure, one thousand pounds dissolved rock; yield, three thousand six hundred and fifty quarts.

Plat 8. Check; yield, two thousand six hundred and thirty quarts.

Plat 9. Two thousand pounds dissolved rock; yield, three thousand and fifty quarts.

Plat 10. One thousand pounds muriate potash; yield, two thousand five hundred and fifty quarts.

EXPERIMENT NO. 11 (1899-1900).

One acre. Soil from gravelly to garden loam. Season very dry.

Plat 1. Manure, two thousand pounds ashes; yield, three thousand six hundred and sixty quarts.

Plat 2. Five thousand pounds ashes; yield, one thousand seven hundred and seventy quarts.

Plat 3. Check; yield, one thousand six hundred and ten quarts.

Plat 4. One thousand pounds sulfate potash; yield, one thousand three hundred and ninety quarts.

Plat 5. One thousand pounds muriate potash; yield, one thousand four hundred and twenty quarts.

Plat 6. One thousand pounds muriate potash, one thousand pounds dissolved rock; yield, one thousand seven hundred and eighty quarts.

Plat 7. Manure, one thousand pounds dissolved rock; yield, three thousand one hundred and seventy quarts.

Plat 8. Check; yield, one thousand five hundred and forty quarts.

Plat 9. Two thousand pounds dissolved rock; yield, two thousand four hundred and ten quarts.

Plat 10. Two thousand pounds gypsum; yield, one thousand five hundred and forty quarts.

REMARKS ON THE FOREGOING RESULTS.

These tables of yields show, as would be expected, a few conflicting results, but through the three years' tests the benefit of using both potash and phosphoric acid may readily be seen, as also the fact that, in most cases, when commercial nitrogen was used, the returns in fruit failed to pay for the outlay.

The benefits derived from the use of potash or phosphoric acid are not only the increase in yields, but these materials had a tendency to harden the fruit, and to give them a richer color. In every case where these have been used, the grower reports firmer and better colored berries, which means better shippers and better sellers.

It will be seen by a study of experiment 1 that when an increase from two hundred to four hundred pounds of wood ashes was made, at a cost of not exceeding one dollar, the yield was greater by six hundred and forty quarts than when only two hundred pounds had been used. This yield, figured at five cents per quart, would mean a gain of $32.20. In the same table, the increase from three hundred to nine hundred pounds of muriate of potash was money well invested. The first increase from three hundred to six hundred pounds, at a cost of $6.20, shows a gain in yield of seven hundred and ninety-two quarts with a money gain at five cents a quart of $36.90. Again, increasing the amount of potash three hundred pounds, making nine hundred pounds per acre at an increase in cost of but $12.50, the gain in fruit is shown to be one thousand seven hundred and eighty-two quarts, and the money gain $89.10.

In experiment 2 the result of increasing from five hundred to one thousand pounds of dissolved rock, at a cost of not over ten dollars, was a cash gain of $54.65. Nitrate of soda used alone gave a yield of eight

hundred quarts per acre less than when the same weight of muriate of potash was used with it.

Experiment 3. These results would tend to show that the soil had a large amount of available potash and was benefited by the application of nitrate soda.

Experiment 4 shows a phenomenal yield in both cases, and an almost incredible increase when then the dissolved rock was doubled, at an expenditure of a comparatively small amount of money. Each of these plats was one-tenth of an acre in area—large enough to be of value as to an average—and the yield is well authenticated.

Experiment 5. This test was on low muck land and will well repay a careful study. Notice that where nitrate of soda was increased from three to five hundred pounds, the yield did not equal the first, but where muriate of potash was increased from three to five hundred pounds (plats 1 and 5), the yield was raised over one thousand quarts. On Plat 5, there was too much growth of vine; the berries were soft and not equal in quality and firmness to those on the other plats.

Experiment 6 shows no practical difference between the use of potash or phosphoric acid, but it does show that the addition of nitrate of soda was of no benefit.

Experiment 7. This table shows a fairly well-balanced fertilizer, each plat yielding considerable above the average per acre. The muriate of potash, however, shows to better advantage than the sulfate, a result that is to be seen in other tables as well.

Experiment 8. The land on which this experiment was made evidently needs potash, the nitrate of soda and dissolved rock plats yielding almost one thousand quarts less per acre than the potash in combination with nitrate of soda or than the potash alone. The small yield in Experiment No. 8 was no doubt due in great part to the fact that the fertilizer was received late and was not applied until August before the fruiting. The succeeding crop of wheat showed that the berries did not get all the fertilizer, for the wheat was much better on the fertilizer plats.

Experiment 9 represents an acre plat selected because of its known history, it being a rather stony pasture that had never been plowed and was so poor that the owner said it was practically worthless. The sod, which was very thin, was turned under early in the spring, the large stones removed, the ground thoroughly fitted and planted. Clean cultivation was given throughout the growing season, and a mulch of straw was given in November. Unfortunately, the fertilizer applied to Plats 5 and 6 was sown too close to the plants, destroying almost every one, thus causing those plats to be left out of the experiment. As would be expected from the condition of the land and the further handicap of an extremely dry season throughout the plant-making period, the yields on every plat were very small, but the benefit of using dissolved rock may readily be seen; as may also the use of manure used on Plats 1 and 7. These plats, 1 and 7, made more plants, resisted the drought better and were marked for the largest yield; but the fruiting season showed that Plat 9 had the

material in the soil to produce not as many berries as Plat 1, but much larger ones.

Experiment 10. This experiment would seem to show that ashes were by far the best of any fertilizer used, but an explanation of the conditions will modify the conclusions. Plats 1 and 2 were next to a four-foot stone fence, sheltered from the cold winds of fall and spring, being covered with a good coat of snow through the winter months. Added to this was the fact that the May beetles in flying from an adjoining pasture field did not settle to the ground until they had passed the space where these plats were subsequently planted. The ground was practically clear of grubs which were quite destructive in the remainder of the plats, especially so on the one-half of the acre containing Plats 6 to 10, inclusive. This being the case, dissolved rock again shows its value. On plat 2 fresh cow manure was applied at the rate of thirty thousand pounds to the acre before the plants were set, resulting in much more growth than on the other plats; the berries, however, were not as good as on the fertilizer plats.

Experiment 11. This table shows in a less degree the same conditions as in Table 10. Plat 1, having a more sheltered position and being lower than the remainder of the bed, had the benefit of more moisture through two dry seasons, that of plant-growing and that of fruiting. Otherwise the results are in accord with those of the larger part of these tests.

General Conclusion.—The first striking fact about these tests is the high yield of the fertilizer plats. Omitting Experiment 9, in which part of the plants were killed by the fertilizer and in which the soil was very poor and stony, the average yield from fifty-five tests was five thousand one hundred and ninety-seven quarts per acre, or two thousand quarts above the average. The second general result is the superiority of potassic and phosphoric fertilizers as compared with the nitrogenous. The nitrogen fertilizers, including very heavy applications of stable manure, gave too much growth and an inferior quality of fruit. It must be remembered, however, that these strawberry growers are good cultivators and that their tillage probably supplied sufficient nitrogen in most cases.

TESTIMONY OF THE GROWERS.

In order to ascertain the farm value of these experiments, the following questions were asked of four of the growers who had charge of the experimental work:

1. Did the use of fertilizers of any kind increase the yield?
2. Did they add to the firmness of the fruits?
3. Did they add to the color of the fruits?
4. Do you use commercial fertilizer every year?

Grower No. 1 writes in reply to these questions:

1. Yes.
2. Yes, if used in proper quantities.
3. Same answer as for 2.

4. Yes, cannot get good stand of vines without it.

Grower No. 2 writes as follows:

1. Yes.

2. Yes, by the use of dissolved rock and potash.

3. I could not say.

4. I shall do so in the future. Have just had a lot put up of fifteen per cent. phosphoric acid and ten per cent muriate of potash.

This grower further says: "I am much in favor of the use of phosphoric acid, but I used a bone and potash fertilizer last year applied in the fall with good results. I have taken the lead in yield and large fruits at this place for the past two years."

Grower No. 3 says in answer:

1. The yield was twice as great as when no fertilizer was used.

2. The fruits were firmer where fertilizers were used; in fact, no claim was made by commission men that any of the fruit was soft. However, where the nitrate of soda was used, the fruit was softer than where the other applications were made. Further, my experience in growing strawberries has convinced me that nitrate of soda is not necessary here.

3. Where potash and phosphoric acid were used, the fruits were better colored and better flavored than when nitrate of soda was used. I shall never buy any more nitrate of soda for strawberries. Neither shall I use green manure in the soil before the plants are set.

4. It pays to use commercial fertilizer on strawberries. The application may be made before the plants are set, early in the season after they are set, or during winter when the plants are in a dormant condition.

Grower No. 4 replies: "I got a bigger yield by using the fertilizer, and the berries were firmer and better color. My neighbor next to me had the same kind of berries (Atlantic), and he said my berries sold from three to six cents a quart more than his did."

TESTIMONY OF THE CHEMIST.

When fertilizer experiments are under way, one naturally consults the chemist. One wants to know the chemical nature of the soil. The services of the assistant chemist of the Experiment Station, G. W. Cavanaugh, were therefore secured in these Oswego strawberry investigations. He was asked to analyze the soils. He visited the region, inspected the experiments, took samples, and submitted the following report:

If the application of the various forms of plant food was the determining factor in the productivity of a soil we might well expect definite results from experiments with commercial fertilizers. It is the experience, however, of those who have conducted such experiments, that the results are often at variance. Here one substance tends to increase a crop, and there the same substance seems to have the opposite effect. In some cases that the writer has seen, the check or blank plat yielded more than those fertilized.

When it is a question of restoring or maintaining the productivity of a soil, there are other points to be considered than the application of fer-

tilizers. These points are fully as important as the presence or absence of the small amount of plant food contained in the average fertilizer application.

1. The physical condition or tilth. A good physical condition is necessary to the plants, to enable them to obtain the necessary root growth, and to permit more even distribution of the fertilizer. The very preparation given in bringing about this condition goes a long way in unlocking the identical constituents that are later to be applied. This desirable condition is not to be had in a soil that needs drainage or has a hardpan too near the surface. If the soil is in a rough condition, full of clods, as sometimes happens in clay soils, it is difficult to properly distribute the fertilizer. In general the better the tilth, the more of the fertilizer applied will be available.

2. Fertilizers do not take the place of humus in soils. The commercial fertilizers consist principally of phosphates of lime (mineral), salts of potash (mineral), and some form of combined nitrogen. The two chief sources for available nitrogen are nitrate of soda (mineral), and dried blood (animal). This dried blood, and frequently tankage, are the only substances that would tend to keep up the humus or mold in the soil.

The virgin soil was rich in humus from the fallen leaves of centuries. Under the influences of air, heat and moisture this humus decayed. The products of this decay furnished not only available nitrogen to the plant, but also part of the necessary mineral substances. The rock part of the soil also gave up some of its mineral plant food through the decay of the humus. The presence of humus is necessary for the best physical condition or tilth. The soil on which the yields tabulated in Experiment 9 were obtained contained very little humus. This deficiency of humus, and not the quality of the fertilizer, accounts for the relatively low yield.

The amount of moisture stored in the soil, or brought to it by rains, is a more potent factor than the mere adding of plant food. This is well illustrated by Experiment 10, where the snow protected Plats 1 and 2, and stored more water in the soil.

On account of these various influences there is not necessarily a direct relation between the composition of the soil and some particular substance the application of which will increase fertility. The chemical composition is only one of several important factors that are concerned in productivity. It is the factor least under man's control, and the one to which he should last resort; yet, the addition of commercial fertilizer may sometimes give most profitable results.

II. GENERAL SKETCH OF THE OSWEGO STRAWBERRY INDUSTRY.

Oswego is the center of the most important strawberry industry of New York State. The leading natural advantages of this region for the commercial production of strawberries is the lateness at which the crop matures. When the berry season of New Jersey and Southern New York is past, the Oswego berries are in their prime. The lateness of the crop

is still further emphasized in the selection of late varieties, as Atlantic, Parker Earle, and Gandy. The season open about June 20 and continues for three weeks.

Oswego lies at the southeastern corner of Lake Ontario. The climate of the region is tempered by the lake, and the soil is well adapted to many kinds of fruits. Next to strawberries, pears are the leading fruit crop, and plums and other fruits are prominent. It is at Minetto, in this region, that Schuyler Worden originated the Worden grape and the Worden pear. From Oswego as a center, the fruit interests have spread until most towns in the county (of Oswego) are now producing fruit to an important extent. To the same geographical region belongs the town of Sterling, comprising that part of Cayuga county lying on Lake Ontario. Parker Earle, and Gandy. The season opens about June 20 and continues geographical extent.

SOME FIELD NOTES ON OSWEGO METHODS.

In a region in which a special industry has developed, expert and advanced commercial methods are necessarily to be found. A word may be said in regard to two or three of the points in the Oswego practices.

The question is often asked: What does it cost to grow an acre of strawberries? In order to answer this question, a number of good growers in the Oswego region were asked for figures of actual cost, and the replies form the basis of the following table:

Rent of land, two years	$11 00
Plowing and fitting	6 00
Plants	15 00
Setting plants	4 00
Cultivation	16 00
Straw for winter and fruiting mulch	15 00
Labor—hoeing, pulling weeds, etc	10 00
Total cost	$77 00

Many growers raise berries at a much less cost, and a few exceed this sum, especially wheu located near a large town where rents are high; but it would be safe for one about to engage in strawberry growing to figure close to this total, aside from the cost of fertilizer.

As to methods of planting, it may be said that the old method has been discarded,—planting in rows three to three and one-half feet apart and the plants from twelve to fifteen inches apart iu rows, keeping off the runners until late in July and then allowing the runners to grow and root at will, making a matted row. In this old system many plants are almost on top of others, the roots barely in the ground, and they suffer in a season of drought. The rows are so wide that to pick fruit in the center it is almost necessary to crush fruits on the outside of the row. This system gives few large first-class fruits. The up-to-date grower starts with the assumption that the largest and highest colored fruits are found on plants along the outside of the rows, and therefore he plans to have as many outside rows as possible. This he accomplished by having his rows closer together and much narrower. The rows are made from

thirty to thirty-six inches apart and the plants from eighteen to twenty-four or even thirty inches apart in the rows, much depending on the capability of the variety as a plant-maker. If the plants used for a new bed are strong and start into growth vigorously, the first runners are used, as it has been found that under most conditions the plants about twelve months old yield the greatest number of fine fruits. These first runners are usually "bedded in," i. e., planted by hand, training them along the wide way of the rows, using from four to eight of the first runners and cutting off those growing later. This method of planting allows cultivation both ways until the runners start, retaining moisture and saving labor in hoeing.

Clean straw or swale grass makes the best winter mulch. The rows are covered two to four inches deep. This winter mulch should be raked from the plants and left between the rows as a protection to the fruits and a safeguard against drought in the fruiting season.

The use of well-rotted manure, plowed under when fitting the land for plants, gives the best of results in many cases. Especially is this the case when a dry growing season occurs, the plants being able at once to obtain available plant food and growing without a check and making runners early in the season. In many soils the manure adds the needed humus. Green or half-rotted manure is more often an injury than a benefit because of the many weed seeds it contains. Many strawberry beds are practically ruined by the weeds introduced by the use of such manure. Perhaps the better method of using manure is to apply it rather heavily to the crop grown on the land the year before strawberries are planted, following that crop with a cover crop to be turned under in the spring before setting plants.

The best growers are always experimenting, and as a result many special practices have developed. One of these, by George A. Davis, will serve as a type: "Last year I marked a three-acre piece three and one-fourth by four feet, setting two plants nine inches apart at each crossing. I cultivated the piece both ways until the plants became numerous enough so that there was risk of destroying them. Then cultivation was continued only one way. The plants were then bedded in the narrow way (three and one-half feet), and the cultivator was only run lengthwise (in four-foot space), gradually narrowing the cultivator as the plants become more numerous. By this method (two plants in a place) there is (1) less risk of waste ground, that is, if a grub eats one there still remains a plant to fill the space; (2) there is more space for pickers; (3) cultivator saves expense in hoeing; (4) new plants root much more readily when the soil has been cultivated than in the single matted rows."

RANDOM THOUGHTS ON THE APPLE.

PAPER READ BEFORE THE NORTHWEST FRUITGROWERS' ASSSOCIATION MEETING, PORTLAND, FEBRUARY 5, 6, 7, 1901.

By Prof. E. L. Smith.

As far as can be ascertained, from data at hand, the commercial apple orchards of Oregon comprise sixteen thousand five hundred acres. It is also a conservative estimate to place the value of these orchards at $1,650,000, an average of $100 per acre.

A partial examination of these orchards discloses the fact that many of them have been planted in soil unsuited for their growth, either too wet, too arid or too shallow. The apple delights in a strong, deep, well-drained loam, and I hazard an estimate that our apple orchards would be worth ten per cent more than the foregoing valuation if they had all been planted in proper soil and situation.

Again, I found many orchards with trees set too closely, one at ten and many at sixteen to twenty feet apart. In such orchards the elements of plant growth are soon exhausted and early mortality is the result. I again record a guess that the apple orchards of our state would have had an increased valuation of twenty per cent if all the trees had been planted not less than thirty feet apart, with possible exceptions in hot and arid districts.

And yet another trouble: The varieties we grow are indeed many and at a local fruit fair I have counted over one hundred and thirty kinds. We raise too many early apples that cannot be forced upon the markets, and too many varieties that are unknown to the consumers of apples, and too limited quantities of those of recognized merit; and as I am in the guessing line I venture a third estimate, that our orchards would have had an increased value of twenty per cent if not one of them contained more than half a dozen varieties, and those such as experience had proved best adapted to each particular locality.

There are other considerable percentages of loss resulting from bad pruning, indifferent cultivation, etc., which I cannot tarry to consider. To recapitulate we have:

Loss from unsuitable conditions of locality	10 per cent
Loss from setting trees too closely	20 per cent
Loss from planting too many varieties	20 per cent
Total	50 per cent

In other words, I believe that the individuals and the state would have been $825,000 better off if our apple orchards had all been planted in proper locations, trees farther apart, and with a less number of varieties and those of standard kinds.

It is understood that the foregoing estimates simply represent an individual opinion based on observation and with no claim for accuracy.

What varieties to plant is the most troublesome question that perplexes the brain of the applegrower.

He should, however, have no trouble in deciding not to plant more than a half dozen varieties, be his orchard ever so large, and those of well-known local adaption and favorites in the markets. So far we have plain sailing, but when he comes to select the four or five kinds he will plant, then comes confusion and indecision.

The nurseryman will offer him, at an extravagant price, some new variety, the latest wonder in the pomological world; and if he bites, and who of us have not bitten, in all probability in a few years he will be hunting a man to topwork his trees with older varieties of greater merit.

Let me be understood as favoring new and promising seedlings and expect much from them, but believe it unwise to plant largely of them until they have been well tested and have won their way to public favor. Indeed I know of no more tempting field for the young horticulturist than the breeding of new seedlings and the cross-breeding of varieties, a process of which Luther Burbank is the greatest living exponent.

Having decided to plant only a few varieties in our commercial orchards, shall we select those which will bear early and annually a coarse fruit or those which will give us a less quantity but of highest quality.

I confess to having a little sentiment in my orcharding and will not hereafter knowingly plant a tree that rates less than seven in a scale of ten as to quality, except for pollination. Expressive of this conclusion I beg leave to quote briefly from a paper prepared by Charles W. Garfield, of Grand Rapids, Michigan, for the meeting of the American Pomological Society, at Philadelphia, in 1899. The excerpt is as follows:

"If I were to plant an orchard today, after choosing my location with regard to climate and giving due consideration to soil and hardiness of trees, I would make everything else subservient to taste. I would grow varieties that would tickle the most sensitive palate and I would expend my best thought and management to cultivating sensitiveness of taste and awaken a desire for the most superb quality.

"My immediate purpose would be the opening to their depths of the fattest pocketbooks and I would cherish in my heart that conviction that when my business should reach the historical stage it would be to me a source of satisfaction and commendable pride."

I have before me a list of more than three hundred varieties of apples, selected by G. W. Bracket, pomologist, Department of Agriculture, revised by a committee of veteran pomologists of the American Pomological Society and recommended for cultivation.

I have copied from this list, thinking it may be of interest, the names of those varieties that do not fall below eight as to quality in a scale of ten. They are as follows, rating eight to nine: Benoni, Early Joe, Jeffris, Northern Spy, Red Canada, Tompkins' King, Bethel, Fall Wine, Jonathan, Pomme Gris, Roman Stem, White Pearmain, American Golden Russet,

Famuse, Mother, Porter, Stayman Winesap, Yellow Belleflower, Gravenstein.

Varieties of highest quality rating nine to ten are few in number. They are: Primate, nine; Dyer, nine to ten; Esopus, ten; Grimes Golden, nine to ten; Summer Pearmain, nine to ten; Yellow Newton, ten.

If I were to select for my own locality three of the above varieties, I should not hesitate to name Yellow Newton, Esopus, and Jonathan, but these kinds are not the best for the cool, moist climate of other portions of our state, and I again emphasize the point that in selecting your trees you must take into consideration their adaptation to your climatic and local conditions of soil, temperature, and moisture.

Having selected your trees, planted and cultivated them to maturity, there may be disappointment yet in store for you on account of their variableness. Trees of the same variety and grown under similar conditions vary greatly as to vigor and fruitfulness, and as like begets like in both animal and vegetable kingdom, is it not reasonable that these variations are transmitted from generation to generation?

We have been far too careless in the breeding of our trees. The stock, poultry and even Belgian hare man lays great stress in "pedigree," but we horticulturists have been indifferent to the ancestry of our trees.

I am of the decided opinion that if we cut our scions and buds only from vigorous, fruitful trees and these worked on thrifty, healthy stocks only, beneficial results would follow and the physical conditions of our orchards vastly improved.

Our orchards also vary in a yet more marked degree and from quite a different cause, namely, the variableness of the owners.

Adaption of soil is scarcely of more importance than adaptation of the fruitgrower to his chosen pursuit. Fruitgrowing in Oregon, unlike that of twenty years ago, has become a scientific profession, and the novice who engages in it without qualification seldom overtakes the rainbow of his expectations. There is another element at times sadly lacking in this noble industry—that of conscience. We need more conscience in the nursery in order that the fruit of trees labeled late winter may not decline to remain with us later than August or September. We need more conscience in the packing houses, where we should cease to cover over lower grades with a veneering of No. 1. And we need somehow to overcome that fatality of the salesroom which so frequently reports consignments in bad order and the markets glutted.

I hasten to conclude this brief paper, trusting that we may glean much truth from the storm of criticism that I am confident it will arouse.

The apple has been well called the king fruit of the temperate zone. Evolved from the humble crab it may not yet have attained its greatest excellence; and though beset with numberless enemies the intelligence of man shall overcome them. The apple consumers of the world are rapidly increasing through improved facilities, transportation and markets hitherto unknown opening up to us on every hand. Fellow horticulturists, let us go in and occupy the land.

NEEDS OF THE FRUIT TRADE.

PAPER READ BEFORE AMERICAN POMOLOGICAL SOCIETY, AT BUFFALO, NEW YORK, SEPTEMBER 12 AND 13, 1901.

By Hon. Henry E. Dosch, Portland, Oregon.

Speaking for the Pacific Northwest, of which portion of our county I have a more intimate knowledge in horticulture, particularly Oregon, I beg to say, that this State earned early in the development of the fruit industry, the soubriquet of the "land of red apples," and the banner then hoisted has remained at its masthead ever since.

The first planting of fruits in Oregon that we have any authentic data of, was in 1847, when Mr. Henderson Lewelling, of Iowa, brought across the plains several hundred yearling grafted trees of all varieties then grown and known in the middle West. These trees were planted in boxes, fitted in a wagon and carefully watered and cared for on their long journey of six months, with an ox team, three thousand miles, to the Willamette valley in Oregon, where the first orchard was planted and from which developed the large fruit industry of today. It may be interesting to you to know that the first apples of these trees were sold for one dollar each and those exported to San Francisco in 1853 for two dollars per pound; prices now received for forty-five-pound boxes of apples.

Out of this small planting of trees made in 1848 grew the orchards of the present time, consisting of commercial orchards—old orchards not being figured—as follows:

Apples	16,500 acres
Pears	2,100 acres
Prunes	27,000 acres
Cherries	1,200 acres
Peaches	1,800 acres
Mixed plantations	4,700 acres
Total	53,300 acres

The newer plantations being principally winter apples expressly grown for foreign markets.

My observation at the Columbia Exposition at Chicago, the Trans-Mississippi Exposition at Omaha, and at this Pan-American Exposition at Buffalo, leads me to the conclusion that the apple is the commercial fruit par excellence of the whole world, as a fresh fruit, followed by our fine Italian, or as they are known to the trade, "Oregon," prunes as an evaporated product; these are the fruits we can consider commercially only for export trade.

The subject of markets is perhaps the most serious problem confronting the fruit grower, and when we look over the large area that has been and

is still being planted throughout the fruit districts of the United States and Canada, we cannot help speculating what to do with all these fruits, especially in a good fruit year.

There is perhaps no fruit which is more universally planted at this time, than the apple, owing to the fact stated before, that the apple is regarded as the commercial fruit of the world. Millions of trees are being planted yearly, and if it were not for the fact that winter apples grow, as yet, in comparatively few localities, the result would be appalling. Even as it is, our home markets are now fully supplied, and in a short time will be glutted. There is but one solution to this problem, and that is to seek foreign markets.

My attention was first drawn to this matter about ten years ago, when the Chamber of Commerce of Portland honored me as a delegate to the Nicaragua Canal Convention, which was held in New Orleans and there in conversation with the representatives from South American Republics, learned that there would be a good market for northern-grown fruits, if freight rates could be arranged. Again my attention was called to it in a letter I received from the American consul at Manchester, England, four years ago, stating that a lot of Oregon apples had found their way there; that finer apples were never seen, and buyers wanted to contract for the entire output of this man's crop, which was four thousand boxes, in 1898, and all were shipped to that point. In this connection the New York Journal of Commerce said at that time, "A large increase in the shipment of Pacific coast apples abroad by way of New York this year (1898) is a noteworthy feature of the fruit trade, and is exciting no little interest; large quantities of Newtown Pippins in boxes weighing fifty pounds net, grown on the Pacific coast, principally in Oregon, have been sent to this city of late in carload lots, and from New York have been sent directly abroad, selling at eleven shillings per box in England."

Encouraged by this a commission house of Portland, Oregon, sent a carload of Newtown Pippins to Hamburg, Germany, which were sold for fifteen marks, or $3.65 per box, equal to $10.95 per barrel. Some six weeks after that sale, a gentleman came to my office and presented his card. He proved to be a commission merchant from Hamburg, Germany, and said to me, that he was present when that car of apples was auctioned off, and was one of the bidders. He was so impressed with the fine quality of these apples that he came over in person to make arrangements for his future supply.

These shipments have been followed up very closely by various growers and developed so rapidly that last year nearly the entire output of Southern and Eastern Oregon-grown Newtons and Jonathans, some two hundred and sixty-five carloads, were shipped direct to England and Germany, netting the grower one dollar per box of forty-five pounds, f. o. b. shipping station. These shipments were distributed as follows:

	Cars.	Boxes.
To Liverpool	120	72,000
To London	45	27,000
To Glasgow	8	4,800
To Manchester	7	4,200
To Hamburg	30	18,000
To various points	25	15,000
Total	235	141,000

Owing to the extra large crop of apples in Oregon this year, the favor with which these apples were received in European markets heretofore and the shortage of the apple crop in other export points, these shipments will undoubtedly be doubled the present season; already buyers are in the Oregon markets paying as high as $1.50 per box for four-tier export apples, which is equal to $4.50 per barrel f. o. b.

I have given the development and needs of the export trade a good deal of thought and attention. For years past I have placed myself in communication with American consuls throughout the world, for the benefit of our orchardists and beg permission to quote a few words from Consul Cunningham in Chemnitz, Germany, a large manufacturing centre, and which voices nearly all reports received. He says: "I wish I had time to detail to you the desire of the people here for our fruit. Germans hunger for our fruits, apples before all others, etc., etc." This is not alone true of Germany, but of all other countries and more recently the Orient, which opens up a new and extensive field of operation.

Hon. W. H. Seward, in a speech delivered in the United States Senate, as far back as 1852, said: "The Pacific Ocean, its shores, its islands and the vast regions beyond, will become the chief theater of events in the world's great hereafter."

This hereafter is here right now, perhaps much sooner than that great statesman anticipated, but he did not know then that he was standing at the threshold of an electrical age, when events pass with lightning rapidity, and what is new today is old tomorrow. There is no doubt in my mind that China, Japan, the Philippine Islands and Siberia will consume in time all the fresh apples and evaporated prunes and pears grown on the Pacific coast, if properly introduced in those markets.

NEEDS.

It has always been with me an applied business proposition, that if there is no market, create one by educating the consumer, and the dealer will readily respond. This is particularly true of the apple, for the apple is, among fruits, what the potato is among vegetables; wherever once introduced, it is there to stay.

In the line of apples, it becomes necessary to grow such varieties as will stand ocean transportation. A hard apple and generally a red apple is what the trade demands for that purpose. However, much of this question will be solved by shipping in cold storage.

In this connection it is proper to consider the prices obtained in the markets of England and Germany for the different varieties of apples as a guide to shippers and to planters of new orchards. Taking auction

figures of several weeks last fall, as a guide, the following table was compiled, showing also that some varieties find more favor and bring higher figures in Germany than in England, and vice versa:

Varieties.	London market.	Hamburg market.
Baldwin	12 to 16 shillings per bbl.	13 to 21 marks per bbl.
Ben Davis	12 to 15 shillings per bbl.	9 to 18 marks per bbl.
Winesap	11 to 13 shillings per bbl.	10 to 12 marks per bbl.
York Imperial	16 to 18 shillings per bbl.	16 to 17 marks per bbl.
Tompkins King	15 to 19 shillings per bbl.	15 to 17 marks per bbl.
Northern Spy	13 to 14 shillings per bbl.	17 to 19 marks per bbl.
Spitzenberg	13 to 14 shillings per bbl.	10 to 14 marks per bbl.
Jonathan	17 to 19 shillings per bbl.	17 to 20 marks per bbl.

Pacific coast Newtown Pippins, eleven shillings per box in England, equal to thirty-three shillings per barrel, and fifteen marks per box, equal to $10.95 per barrel, in Germany, which shows that this apple is the favorite in European as well as in American markets.

In catering to these foreign markets we must prepare our fruits in the way they want them, and not in the way we would like to have them taken. But the greatest need of the export trade, if we wish to hold and further develop these foreign markets for our fruits, is that they be honestly graded, honestly packed and honestly labeled. To do otherwise is commercial suicide.

APPLE SHIPMENTS TO THE ORIENT.

By Hon. H. B. Miller, U. S. Consul, New Chwang, China.

As the subject of apple growing in Oregon has taken on a new impetus, a report of an experiment made by me in shipping apples to the Orient, together with a few observations concerning the trade, may be of some interest.

September 28, 1901, I shipped fifty boxes of apples from Portland, Oregon, to New Chwang, China, via the Portland and Oriental Steamship Company. These were transferred at Kobe, Japan, to another steamer bound for New Chwang, which place they reached November 10.

They were packed in ordinary light ten by eleven by twenty-two boxes, cleated on both sides, and apples were wrapped in paper. The packages held in good shape and every box arrived intact.

I shipped several varieties as an experiment, with the following result:

	Loss.
Ben Davis	2 per cent
Tawoer	10 per cent
Spitzenberg	10 per cent
Shannon Pippin	25 per cent
Jonathan	50 per cent
Red Russian	75 per cent

From this experiment and observations of shipments to Shanghai I consider the Ben Davis the best apple for the Oriental trade, but would not advise planting them.

California ships quite a number of her third-grade Yellow Newtowns to China. Some of these are consumed by foreigners, but most of them go to the Chinese fruit stands and restaurants and are eaten by the Chinese. These apples are usually immature, wilted, and tasteless, and would not be eaten at home.

The Chinese appetite is strong for fresh fruit and apples are in great favor with them, and the only difficulty with a large market here for apples is the ability of the masses to purchase.

The senses of smell and taste are not fine with the average Chinaman and he does not distinguish the difference between the different qualities of the same variety of apples; in fact I am not sure that he would even distinguish the difference in varieties. If the inferior grades of the proper shipping varieties, of apples grown on the Pacific coast, could be sent to China for the Chinese trade at a low cost I am convinced that an extensive and permanent market can be created. There is little prospect, however, of this being done until it is taken in hand by a large organization of apple growers. It will come as a result of organization. A hundred million of Chinese can be reached from the Pacific coast of America entirely by water transportation at low freight rates. This one great feature of Chinese commerce is not generally understood and fully appreciated.

Ben Davis, Yellow Newtowns, and Winesaps, and similar varieties will carry well to these markets. Baldwins, Spitzenbergs, Northern Spys, and all of that class will not succeed. Several thousand boxes of Ben Davis apples are shipped to China every year, and they invariably reach there in good condition, coming from either Portland, Seattle, or Vancouver, B. C. These northern routes are the best for shipping green fruits on account of the lower temperature of the water and therefore less heat in the hold of the vessel.

Apple shipments for all the northern ports of China should be shipped by October 1, on account of danger of freezing if arriving late in the season. If apples reach North China in good condition they will keep well there on account of the dry, cold climate.

RUSSIANS ON THE PACIFIC.

In this connection I wish to emphasize the fact that Russia is already on the Pacific, having built three important cities within the last few years, viz.: Vladivostock, Port Arthur, and Dalny. They will continue to come in increasing numbers, and in a few years or by the time that orchards now being planted in Oregon begin to bear fruit, their naval, military, merchant marine, commercial, and industrial numbers will be enormous, and the Russians are great lovers of apples.

I have had the pleasure of presenting some of my apples to Russian friends and their enjoyment of them and praise has been to be a source of wonder.

APPLES IN JAPAN.

A trip through Japan in October opened my eyes to the possibility of apples growing there. I found all the markets supplied with a fair quality

of apples grown in the northern part of Japan. From what I saw I am convinced that splendid apples can be grown in Japan, and some day she will be our competitor in the Oriental markets with this fruit.

The most serious difficulty they have to contend with is the black fungus, differing little from the apple scab of Oregon, due no doubt to the conditions of severe moisture. I saw very few apples free from it, and most of these would be unsalable in our country.

FOREIGN MARKETS FOR OREGON FRUIT.

PAPER READ AT NORTHWEST FRUITGROWERS' CONVENTION, JANUARY 28 AND 29, 1902.

By John D. Olwell, Central Point, Oregon.

The question seems to be, not so much demand as supply. The prospects for foreign markets are very flattering. We have received the best prices possible for our fruit the past few years, and there is no reason why we shall not do so in the future. Growers must bear in mind that the maintaining of high prices depends entirely upon themselves. First, they must raise such fruit as is in demand, free from blemishes, of good color, and above all, of the best keeping and carrying qualities. Then, honesty in assorting and packing, coupled with a desire to give the consumer value for his money, will get compensation prices.

With the added experience and better judgment that is being exercised on the part of the grower in the planting, cultivating, harvesting, packing, and marketing, the outlook was never brighter for the fresh fruit industry.

Our export trade has in it possibilities of development far beyond present comprehension. The apple consumers of the world are rapidly increasing in numbers, through improved transportation facilities, and markets hitherto unknown to us are opening up on every side. Many apples are shipped each year from the Pacific coast states to Australia, the Winesap meeting with much favor there, "though nearly all good-keeping red varieties are in demand." The shipments to China and Japan have not as yet been very heavy, our prices having been too high for the general masses of their people. However, the Asiatic demand may grow when our apples are more thoroughly introduced. Within the past two or three years quite a market has opened up in Siberia for Pacific coast apples, and many varieties have found ready sale.

It must not be lost sight of that it is necessary to grow "hard apples" for export; in other words, such varieties as will stand ocean transportation. To Germany and France we ship many red varieties and some Yellow Newtowns. In England the choice is entirely Yellow Newtowns. The Newtown might well be called "The Salt Water Apple," for it carries better than all others. The apples from the Pacific Coast must hold the premier place in the world's markets, especially those from the higher

FRUIT EXHIBIT—CHARLESTON, S. C., EXPOSITION—1901-1902.

FRUIT EXHIBIT—CHARLESTON, S. C., EXPOSITION—1901-1902.

CERTIFICATE OF AWARD.

No.

STATE OF OREGON,

PORTLAND, OREGON.

Dear Sir:

You are hereby informed that you have been awarded at the South Carolina Inter-State and West Indian Exposition, GOLD MEDAL for your collective exhibit of Pomological Fruits, Cereals & Grain.

The Diploma of the Exposition will be issued to you at a subsequent time. Should you desire a copy of the Medal, you may correspond with this office.

Respectfully yours,

Selim H. Peabody,

Superintendent of Awards.

Address correspondence to E. L. TESSIER, Jr.,
Manager of Exhibits and Concessions,
Charleston, S. C.

altitudes, from the valleys nestling among the mountains, which insures mild temperature and equable climate, allowing the apple to mature on the tree, giving it size, coloring, crispness and flavor.

The commercial apple orchards of Oregon are conducted along strictly business lines. They are pruned each season, plowed and cultivated as required, thoroughly sprayed with proper compounds, several times each year, to combat and overcome fungus disease and insect pests, and in consequence the loss in some orchards from infested or diseased fruit is very slight, frequently as low as five per cent. The laws concerning infected fruit are very stringent in most foreign ports, and much care is exercised to pack and ship only such fruit as is entirely free from scale.

Quick transportation, the telegram, the cablegram, enable the grower to practically market his own product. In this connection it may be noted that the watchfulness and accommodation of the railroad company officials in promptly furnishing us with refrigerator cars, the reasonable carload rates from Oregon to New York, enabling us to place our apples on dock at New York for one dollar per hundred weight, or fifty cents per box, are important factors.

The picking and storing is carefully looked after, and in the packing house the fruit is graded, any of irregular size or quality is laid aside for other purposes than export. The packing is done by experienced girl packers. Each apple is wrapped in paper, and placed in a box which has previously been lined with paper. Between each tier of apples a layer of cardboard is placed, and each box is inspected by the overseer. When finished, the boxes present a very attractive appearance, the top and bottom having a heavy swell when nailed. The name and grade are stamped on box at top of brand. The boxes are carefully packed in the car, car strips being placed between each tier of boxes to insure proper and sufficient ventilation, and great care is taken to so brace the car that any shifting or moving of the mass in transit is impossible. Thus the long journey to New York is safely made, the apples arriving in prime condition. In fact, the fruit carries so well when properly packed and loaded, that a five-mile ride in wagon over average country roads would be more detrimental to it than the entire journey to Europe.

In the markets the apples are sold at auction to the highest bidder. Our fruit seems to have succeeded in making a demand wherever introduced, and constant inquiries arrive in regard to good fruit. Grown and packed as it should be, we need have no year of over-production, for with the splendid keeping qualities of our apples, we will always have a market for them. The pack and quality of our fruit meet with such favor abroad that strictly fancy four-tier Yellow Newtown apples from the Rogue river valley have realized $3.48 per box. This was considered the record breaker for the season. At the time sale was made of this particular lot, the markets abroad were loaded with apples from California points selling on a basis of from seven to ten shillings per box, or an average of but little more than half of price of best Oregon product.

Spitzenbergs brought $1.50 per box at orchard. The latter found a market in New York and Chicago. Many buyers from London and eastern cities come directly to orchard to contract for our fruit. There seems to be unlimited demand for strictly high-grade fancy stock.

Let the watchword be—Quality—Quality—QUALITY!

FRUIT UNIONS.

PAPER READ BEFORE FRUITGROWERS' CONVENTION AND STUDENTS OF OREGON AGRICULTURAL COLLEGE, AT CORVALLIS, FEBRUARY 13 AND 14, 1902.

By Prof. E. L. Smith.

Of all the industrial classes, the farmer and horticulturist is the least inclined to enter into, and profit by united and organized effort.

Over production has been followed by such demoralizing and ruinous competition that most of the industries of the country have been driven into combines for self preservation.

Manufacturers have very generally entered into great corporate trusts, absorbing competing concerns, and instead of selling their products at unprofitable prices as they may have done in the past, have gone to the opposite extreme in order that dividends may be declared on unreal values.

Transportation companies with parallel lines demoralized tariffs in the struggle for business and landed in the hands of receivers.

Entering into binding compacts to maintain uniformity of rates the receivers were soon discharged and control restored to them.

The laborer, without whom there would be no traffic, and we might add no civilization, perceiving that he counted for so little as an individual and that there was force and influence in the aggregation if members organized, his union and obtained valuable concessions, that would never have come to him through individual effort.

Corporations stretch the wires across continents or pay out the long cables that rest on ocean beds, wires burdened with the business exchanges of the world or momentous affairs of governments. On every side we are confronted with numberless combinations of men and money transacting the business affairs of the world.

The same rule of effective organization obtains outside of industrial classes. The sects of christendom propagate their tenets through conferences and councils, through bishops and cardinals and that denomenation has the firmest hold upon its members that is most thoroughly organized. Even the politician relies upon his caucus, conventions and committee men to aid his ambitions and woe to the helpless aspirant who cannot enlist the support of the machine.

Our horticulturist, however, with a rugged independence that we admire, but a judgment we cannot approve, hesitates to co-operate with his co-laborer and fights shy of organization, no matter how simple.

We must admit that there is some reason for this and that fruit unions have their weak as well as strong points. Possibly he may have known of some such organization that went up like a rocket but came down in a far less brilliant manner, probably on account of mismanagement.

There is no disguising the fact that the earlier experiences of co-operative fruit unions are frequently most discouraging; sometimes on account of incompetency of the manager or board of control, or more frequently as is the case, because their stockholders were not loyal to their own organization.

Possibly our brother fruit-grower has made consignments of fruit so fancy that he was certain that he would capture the market, and when the account of sales were returned there was hardly sufficient to pay transportation charges and commissions, or ignorant of the markets he has sold when he ought to have held, and held when he ought to have sold, until he looks with suspicion upon every one who proposes to handle his harvest.

It is indeed too true that the elements of danger to fruit unions are distrust, incompetency and home competition. The fruit growers have suffered so frequently from those better informed than themselves, that it is next to impossible to convince them that they can safely trust their business interests even to their own neighbors.

There is a class yet more helpless who in order to avoid the petty charges of the union or to demonstrate their acuteness, ship on their own account and profit by the prices that the union has been instrumental in sustaining or cut those prices and demoralized the market.

Let us consider briefly some of the more pleasing features of co-operations. Fruit unions are undoubtedly trusts, but quite unlike those immense aggregations of brain and capital, that labor to enrich the few at the expense of both producer and consumer.

The union seeks to elevate labor and reward it with a living compensation. Its capital usually is nominal, merely sufficient to provide for current expenses for transacting its business and hence does not have to extort either from labor or consumption a profit for dividends on fictitious valuations.

A co-operative union educates its members along the lines of their occupation; always aims to promote highest standards of excellence, secures uniformity in the grading of products and dispose of them at wholesale instead of each grower retailing what he has grown, thereby saving to him both time and money.

The union makes liberal use of the wires and hence is able to make a more intelligent distribution of our fruits than growers acting independently possibly can do. It is advised as to shipments from competing places and is careful to limit its shipments to any place where there is danger of loading the market with more than can profitably be sold.

It has daily information as to the state of the markets in larger towns and as they are subject to frequent fluctuation frequently diverts shipments when en route.

The union being a member of the Commercial Agency has a knowledge of the financial standing of its customers and consequently its losses from bad accounts are minimum.

The union encourages the purchase of its fruits at the home station and discourages consignments. If an independent shipper will offer more than quotations warrant it does not hesitate to sell to him, or to any one else and at times may purchase fruits that are likely to be offered in competition for less than union prices in order that the market may be protected.

In California it has deemed wise to give to the public daily quotations from Eastern cities in order that those not members of the union might not be induced to undersell the associations.

A union searches out new markets and extends its business over the widest possible area of country. The union attracts buyers and having much to sell gets the higher prices and the better service from the transportation companies.

The union maintains brokers at important centers who sell and distribute shipments to retailers being pledged to maintain prices on their part.

And not the least among the benefits of fruit co-operation, members acquire a better knowledge of business methods and learn to trust and appreciate each other as they never did before, and jealousies and suspicion are replaced by confidence and esteem.

We can readily see that in the conduct of these associations much depends upon those to whom their business management is entrusted.

The directors should be men noted for their shrewd business judgment and successful in the conduct of their own affairs.

The manager or superintendent especially, in addition to undoubted integrity, should possess ability and experience and be paid accordingly. The business transactions must be kept in systematic order so that the standing of a member or that of the union itself may be readily ascertained.

There are many instances where these co-operative associations have brought order out of chaos in the markets, doubled returns to shippers, enhanced a hundred fold the value of land, paid off mortgages, and put new life and courage into the community. I am a member of one of these small unions just entering upon the tenth year of its existence, which has done this work, established a reputation for our growers and a market for their products over an extended section of country.

I am of the opinion that the reasons why we have so few fruit organizations in Oregon, Washington and Idaho, may be attributed to the limited amount of our commercial orchards. Such orchards, however, are being grown and these co-operative associations are as certain to follow as there is strength in union.

APPLE GROWING IN JAPAN.

By Hon. H. B. Miller, U. S. Consul, New Chwang, China.

Apple growing in Japan has attracted my attention and I have endeavored to learn the extent of it, as I have seen many Japanese grown apples in the markets of China as well as in Japan. Some of these apples are still in the markets at New Chwang and Port Arthur on May 1st.

The following information I have secured from official sources on special request and presume it is correct.

Apple growing in Japan is carried on mostly in the northern part, on the island of Hokkaido. It is in this locality that the agricultural college for Japan is located.

The country is especially noted for its coal and timber wealth, but is being developed in agriculture and horticulture and applegrowing is taking on the appearance of a permanent commercial industry.

The present acreage in apples on the island is five thousand. Trees are planted at about twenty feet apart and begin bearing the seventh year after planting, and bear at about tne following rate:

7-year-old trees	7 catties	or 10 pounds
10-year-old trees	25 catties	or 34 pounds
15-year-old trees	100 catties	or 134 pounds
18-year-old trees	180 catties	or 250 pounds

The prices usually paid to the producers are as follows:

Early apples	2	sen per catty
Fall apples	3	sen per catty
Winter apples	3.5	sen per catty
March apples	8	sen per catty
May latest	14	sen per catty

A catty is one pound and a third and a sen is equal to half a gold cent.

These apples are packed in dry hardwood sawdust and shipped in boxes and casks of various sizes. While these apples are not equal in quality to the Oregon apples, many of them are very good and the best of all the apples of the Orient except those grown at Chefoo from American stock.

I have never seen any codling moth in the Japanese fruit although I have seen both the moth and San Jose scale on the Chefoo fruit, both on apples and Bartlett pears.

The worst disease and one that is so bad as to seriously injure the fruit is bitter rot, such as is common to the Baldwin apple in the United States. This, together with a black soft fungus that covers the apple in small spots, are serious defects that seem to develop on all varieties and increases with time until it entirely ruins the apple. Much of this is no doubt due to climatic conditions and unless some means are taken to prevent it, the apples of Japan will not interfere much with the Pacific coast fruit in the Orient.

GENERALS IN HORTICULTURE.

PAPER READ AT NORTHWEST FRUIT GROWERS' ASSOCIATION, PORTLAND, 5, 6, 7, 1901,

By Hon. Henry E. Dosch.

We are standing at the threshold of the twentieth century, reverently and with bowed heads, seriously contemplating what it may have in store for us. In the century just closed much has been achieved, especially in the latter part of it. The world has made such rapid strides forward that thinking men were amazed, astounded; what was new today was old tomorrow; hence as we stand gazing into the unrevealed, we cannot help being awed, as we speculate and wonder what the development will be. It is indeed an electrical age. In the closing century we have made wonderful progress in science, art, education and general enlightenment, commerce, mining, manufacture, electricity; yes, even in war, and to some extent in agriculture and horticulture; but, while nearly all of the former have developed leaders and generals, the latter have failed to do so. There may be some reason for this. Agriculture and horticulture, giving a pleasant and quiet life, are perhaps not calculated to impel men to reach out, especially as the commercial side of those engaged in those pursuits has not been thoroughly developed, which may be the reason that the youths of energy, push and activity have not engaged in it, but preferred the world, instead of the farm and orchard, as their field of battle; and yet there is no occupation which at this time offers better opportunities for this very energy, activity and brain than does horticulture.

Horticulture, which is nearest to us and interests us most, needs at this time generals. As we stand and gaze into the unknown, may we not hope that she will give us a horticultural Von Moltke, Grant, Sheridan, Lee, Johnston, Farragut, Clark or Dewey—men who can not only plan the battle, but execute the plans to a successful finish?

On a former occasion I said that we know the soils best adapted for various fruits, the best varieties to plant for family use and commercial purposes, and know how to evaporate them. We have also learned what varieties to plant for pollinating purposes. We know most of the diseases and insects infecting trees and fruit and how to combat them. But the marketing of our products to advantage is the greatest problem that confronts us, which suggests the topic I wish to present—the need of horticultural generals. We have plenty of men who can produce the very best of fruits ready for the market, but there their generalship ends. To place these goods into the world's market at a profit to themselves is a feature they have never studied, and therefore are not able to execute the plans they have so carefully prepared. It required generals of thorough commercial training to do this special work, for the kaleidoscopic

markets of the world change with every turn of the hand. I have given this side of the fruit problem a great deal of thought, study and inquiry for some years past. I have placed myself in communication with commission men and United States consuls all over the world, for the express purpose of learning the condition of fruit crops in their respective localities and the possibilities for a market for our own fruits. The summary of these reports I caused to be published in the daily, weekly and horticultural press, but very, very few generals have developed to take advantage of the situation. I know, however, of one fruitgrower who has shipped over one hundred carloads of apples, mostly of his own growing, to England alone, which netted him a dollar per box, f. o. b. shipping station, for absolutely first-class, four-tier apples.

A few days ago I met a commission merchant who exports many carloads of fruit, and told him that Boston offered a first-class market at the present time, having just returned from there and found only small scabby apples. He laughed and said: "Oh, no; we get better prices for our apples in England and Germany, where you said last fall to ship to."

Last fall a prunegrower came to my office and asked what he should do with his prunes, the growers' association having failed to organize. He showed me some of extra large size and very fine quality, running mostly twenty to thirty to the pound. I told him to take them East into some community where there were a good many Germans, as they know the fine quality of the Italian prune and appreciated them better than most others, but they do not want lye-dipped and processed prunes. He said his were not dipped. A few days ago he returned and told me he sold all his large-sized prunes for twelve cents per pound, while at the very time prunes are offered in this market at most any price.

Colonel T. R. Weaver, of California, an extensive prunegrower, in summing up the existing condition of the California prune situation, said, "What is to be done?" and answered himself: "Simply go to work and sell these goods ourselves by making a demand for them with the consumer, and make it to the interest of the trade, both wholesale and retail, to handle them, because of that demand, and make that demand so great that they can be handled at a smaller margin of profit than at present by the retail trade." Here is another man with advanced ideas, and if he will only remember what Commodore Farragut said on a memorable occasion, "D—n the torpedoes; steam ahead," we will have another horticultural general.

These remarks of Colonel Weaver suggest the thought that the Pan-American exposition, to be held this year, offers an excellent opportunity to carry out his ideas. Within a radius of five hundred miles of Buffalo there is a population of forty million people, and it is reasonably expected that a good proportion of these forty million people will visit this exposition who should be educated and enlightened on the fine qualities of our Italian prune, as an economical, nutritious and wholesome article of food. A few tons of evaporated prunes will do a missionary work, the result of which cannot be readily calculated at this time. A large kettle full

should be properly stewed every day, and at some given hour each afternoon be served gratuitously in a palatable manner in a dainty dish, by still daintier maidens, in the horticultural building, and distributing recipes for the proper preparation of them for the table. The cost would be so small in comparison with the results that it should certainly be undertaken.

The "World Work," a periodical of recent date, has an article very much to the point, and applies so aptly to our horticultural situation that I quote a few sentences:

"Commerce must have its diplomacy no less than nations, and its generals, and its own tactics and policies. Especially is this true since the world has become wire-girt and so swiftly traversed that the whole earth is a market place for every maker of wares for universal use.

"But the making of wares of universal utility does not win a universal market, not even when the maker, offers them cheaper than his competitors. Cheap and excellent manufacture is one thing. Effective massing and distributing is another thing and herein comes the need of great generals in trade.

"No better illustration of such a need could be found than is now given by the industrial condition of Germany. One of the great events of the latter part of the century has been the building up of German manufactures. The government has in every way given its aid. The information collected and distributed for the guidance of manufacturers and traders is the most thorough and systematic in the world. The legend 'Made in Germany,' stamped on manufactured articles of every kind caused consternation in England a year or two ago. In fact, Germany, that is not under arms, is in the workshop; and the strides of German commerce are as remarkable as the rise of German scholarship was a generation ago, and as the rise of German military and political power was under Von Moltke and Bismarck. But now German manufactures are feeling restriction of their prosperity. The trade reports reflect it and the commercial world is becoming aware of it. They are selling many wares without a profit. And the reason is an unscientific preparation for the distribution of products. In one respect the great industrial movement of Germany has not been well generaled."

This is the exact situation of our fruit industry at the present time. The production of excellent marketable fruit is one thing and its effective distribution quite another thing. But let us go another step further. What is Germany doing? Does she go home and sulk, and say overproduction, fruitgrowing does not pay? Not by any means. She at once looks around for executive generals. And at this very time, while the various allies in China are setting their political fences, Germany is building railroads and telegraph lines there, is establishing distributing depots for her manufactured goods, and she is there to stay. Carpenter, the Oriental correspondent, in speaking of trade expansion, says: Germany is getting all the new business and the emperor of Germany is the king drummer of Europe, and his territory is the world."

It is now up to the fruitgrower. Shall we rise to the situation and learn the lesson thus taught? We certainly have the goods and may we not hope that the very first step we take across the threshold of the twentieth century may introduce us to executive horticultural generals?

THE APPLE IN THE WILLAMETTE VALLEY

PAPER READ BEFORE THE OREGON FARMERS' CONGRESS, SALEM, JANUARY 9, 1902.

By Prof. E. L. Smith.

The apple when considered in respect to its beauty of coloring of blossom and fruit; its delicious flavor and hygienic qualities; its wide distribution and length of season, is easily the sovereign fruit of the temperate zones. It is found in portions of China, India and other parts of Asia, flourishes at the Cape of Good Hope in Africa, and in the great islands of Australia and New Zealand; is extensively grown in Great Britain and in continental Europe and is quite at home in the temperate latitudes of both Americas.

Its origin ante-dates the written records of man; it has a place in Grecian and Scandinavian mythology; is mentioned in ancient history, both sacred and profane, and is celebrated in the songs of our greatest poets. But I recognize that I am not addressing an historical society but instead a congress of practical tillers of the soil in search of facts and not generalization.

Permit me, therefore to speak to you for a few moments relative to apple growing in the Willamette valley.

THE OREGON RED APPLE OF OLD.

Thirty-five years ago, attracted by the reputation that the "Oregon red apples" had acquired, I came up from California and visited many of the orchards of Marion and Polk counties. Ever a lover of fine fruits, I had become somewhat familiar with the orchards of New England, of the Middle West and of California, but that October visit was a revelation to me, for never before had I beheld such a harvest. Everywhere I wandered I found healthy, vigorous trees, overburdened with perfect golden and crimson fruit. I seemed to have come into a new Eden—an improved Eden, for contrary to the general belief there is no reference to apples having grown in old Eden, and certainly the Good Lord would never have prohibited his creatures from partaking of such delicious healthful fruit. Baldwins and Winesaps seemed to predominate, but I remember seeing in a large orchard near Jefferson in this (Marion) county, great, golden Belleflowers, falling to the ground to the evident satisfaction of the pigs beneath the trees. At a farm but a short distance from this hall, I purchased several hundred boxes of the largest Winesaps that I had ever seen. I could have bought almost unlimited

quantities of this fine fruit at from twelve and one-half to fifteen cents per bushel. At Portland two steamers were loading thousands of boxes of Willamette valley apples for San Francisco, and, far and near, the Oregon red apples were recognized as the standard of excellence. I regret, friends, that the Willamette apple is no longer the standard of excellence. I go into our local markets and find them demoralized with a flood of dull colored fungus-marked and moth-tunneled fruit that bears but slight resemblance to the perfect apples I saw here in 1866.

A PAINFUL CONTRAST.

And what a contrast in the orchards themselves. Instead of the clear bark and vigorous growth, and I am now speaking of the old orchards, I find moss-covered and cankered trees and branches with scaly bark, affording ideal nesting places for enemies that fasten on the tree and fruit only to destroy. and, worst of all, on account of some supposed climatic changes and account of other adverse conditions that have arisen in these later years, a feeling has obtained among the growers themselves that it is no longer possible to raise high-grade apples, and as a result of half-hearted efforts we find degeneracy stamped on both tree and fruit. I do not share in this opinion that high-grade apples cannot longer be raised in this beautiful valley, for scattered here and there I find well cared for orchards that disprove the theory. Meteorologically speaking, the Willamette section is an ideal one for applegrowing. The same moist, cool breezes that the apples revel in come up from the ocean as they did thirty, forty years ago. We have the same even temperature by day and night, and abundant sunshine of the summer months, followed by the most beautiful of all seasons, the Indian summer, bringing to the orchards everywhere a wealth of gold and scarlet.

CAUSES OF THE CHANGE.

To what then shall we attribute the degeneracy of the apple orchards of the Willamette valley? To two causes, I believe—exhaustion and neglect. Year after year those trees have borne prodigious harvests of incomparable fruit with little or no return to the soil and with little or no attempt to protect them from parasitic and insect enemies. A tree lacking vigor offers the least resistance to diseases and adverse conditions. And, in like manner as the blood of a human being would become impoverished for want of nourishing food, so has the blood of these old trees become impoverished for the lack of those valuable mineral salts, their food which has been exhausted from the soil. If you do not think such is the case, plant a young tree where an old one has grown and the result will be a failure. If the soil has become so impoverished that it will not nourish a young tree, how do you expect an old tree to thrive and perfect its fruit? We might just as reasonably expect an old and enfeebled man to perform the same labor that he did in the vigor and strength of his earlier manhood. Now, in order to ascertain what the soil should contain in an orchard, let us go to the chemist and ask him

to give us the principal mineral constituents of both tree and fruit. He will take an apple, burn it to an ash, analyze the ash and tell us that it contains:

Potash	35.68 parts
Soda	26.09 parts
Phosphoric acid	13.59 parts
Sulphuric acid	6 to 9 parts

He will then analyze the ash of the tree with about the following result:

Potash	19.24 parts
Soda	23.60 parts
Phosphoric and sulphuric acid	18 to 19 parts

It has been demonstrated that the soils of the Willamette valley are not rich in all these elements of fruit production. Yet for thirty, and even forty years we have made continuous requisitions upon them until even mother nature enters a protest at our over-drawn account in the shape of unthrifty trees and inferior fruit.

WILL IT PAY TO RENOVATE?

Can we renovate these orchards? To a certain extent, yes, by returning to the soil what we have taken from it; by cultivation, judicious pruning and thorough spraying. I doubt, however, if it is the better plan. What is wanted is virgin soil, a new generation of trees, and, pardon me, I came near saying, a new generation of growers, for the moss in some instances is not, I fear, all on the trees. We can grow good fruit again in this valley, but it will require infinitely more labor. Vigilant, intelligent and energetic action is the prerequisite of successful horticulture today, and to succeed you must center your principal interest in your orchard and not make it an adjunct of some other business. Practice modern methods and care for your trees as they do in the great orchards of Jackson county and other portions of the state, and you will find that the climate has not changed and that the fruit is as beautiful as in the olden time. Do you plead that aphides and pernicious scales suck the juices of root and branch, requiring ceaseless warfare on your part? Then I do not hesitate to say that unto man has been given dominion over all these and that he shall prevail. Man amounts to but little without a fight, and we only secure the most valuable things in this world through greatest effort.

A HOPE-INSPIRING FORECAST.

Where is the land that affords so great a proportionate area for horticultural pursuits as this magnificent valley? There is not an acre in it of well drained soil but what will grow an orchard unless it has been badly farmed. I often cast my eyes longingly to the foot hills and to the timbered mountain slopes and benches that enclose this valley, and it requires no gift of prophecy to say that eventually your most valuable apple orchards will be found five hundred, one thousand, two thousand feet above the valley, and from these higher elevations your longest-keeping apples will come.

We need a revival of the apple industry in this great valley, but it must be along scientific lines and the most approved field experience or the result will be unfortunate.

The consumption of and demand for apples is increasing wonderfully. Enlarged facilties for transportation have given us the world for a market and it is the foreign and not the local market we must strive for. Last year Hood River strawberries went up the coast to Skagway, thence over the mountains and down the Yukon to Dawson, and more wonderful still, they were carried by steamship to China and reached there in fair order after twenty-six days transit. If we can convey fresh strawberries to Dawson and Hong Kong, we ought to convey Oregon apples to the planet Mars, if they ever get that much talked of railroad built there.

THE DEMAND FOR THE BEST.

A gentleman from France visiting the Pan-American exposition, saw a collection of apples, from my own orchard, which he admired very much, and early last month he came to Oregon and to my orchard at Hood River. He wanted ten carloads of yellow apples for shipment to France. Red apples, he said, were seldom seen on the tables of the rich there, and were called pie apples. He wanted especially Newtown pippins; every one must be perfect and carefully paper wrapped, and for such fruit he was willing to pay $2.00 per box f. o. b. But, alas, the largest lots of Newtown pippins had already been disposed of and we realized the truth of the old adage that "he is the farthest from market who has nothing to sell." I instance this case simply to illustrate the demand for high-grade apples. Let us plant more orchards, for more orchards mean more cottages and more school children. Let us plant in the proper localities and soil; plant the right varieties in the proper manner; watch over them almost as we would were they members of our families; protect them against every enemy that assails them; see that they have proper food and air and sunshine; put the spray pump to work early and late; gather the fruit at the right time and handle it as you would a basket of eggs; use an attractive, clean box, and give an honest pack from top to bottom. Practice these methods and the fruit will be right and the market right. The reputation that Hood River has acquired for both apples and berries is worth not less than twenty-five cents per box or crate.

Shall we not make an effort to win back the good name for our Willamette apples? The State Board of Horticulture is more than willing to contribute everything in their power to aid you, and the professors of the experiment station at Corvallis will render most valuable assistance. Profit by the errors of the past, and more especially by the knowledge of the present. Do your work thoroughly; the careless cultivator will have nothing to compete with and the very conditions you have to contend with, after all, in a measure regulate the markets.

Every fruit center should have its club or fruit union both for educational and business purposes. It is invaluable for comparison of field

practices, for becoming familiar with the work of the experiment stations, for the best preparation of the fruit when grown and for a proper understanding of the markets, all of which are indispensable.

At the close of his paper, Mr. Smith read an article which recently appeared in the Oregonian, which shows the high repute of Oregon apples in New York City.

GRAPE CULTURE.

By Hon. John F. Broetje.

GRAPE CULTURE SUCCESSFUL.

VINEYARDS, PROPERLY MANAGED, WILL YIELD FROM 11,250 TO 22,500 POUNDS TO THE ACRE—HOW TO PLANT VINES.

It seems at all times, from antiquity to the present, the grape has been one of the favorite fruits of most everybody, and much care has been bestowed on its cultivation. We need not be surprised when we learn that emigrants to new countries took grape vines along with them in their new homes. The first settlers who came to the present United States to make their new homes found the grapevine growing wild in the woods everywhere, but the berries were small and sour. However, they were used to some extent. Plants of the European grapevine were brought over to this country and tried, but would not succeed. Larger plantations of the European grapes were made at the first part of the last century, but with no success. Birds carried some seeds of the same into the woods, some of which grew up and hybridized with some of our native kinds, which were greatly improved. Our much esteemed Delaware grape, which was originally found in the woods of New Jersey, is believed to have originated in this way.

About the time of 1825 to 1830, a number of Swiss, together with others, made extensive trials with grapes on the south border and on some islands of Lake Erie. They treated the vines the same way they did in Germany and Switzerland. The European kinds failed entirely.

They then took some of the wild grapes of the woods and planted the same and cultivated them the same as in the old country.

The fruit improved greatly, and from seedlings many new kinds were produced, one of which is the Isabella. But soon they found out that the close planting, four feet by four, and short pruning, to two buds, did not agree with our native kinds; so, gradually, they gave the vine much more room, and in pruning they left the bearing canes much longer, and so they came gradually to the renewing system, which is in practice every where east of the Rocky Mountains. Later on, trials were made by a great many others, all over the country. The result was astonishing. From seeds many new kinds were produced, such as the Catawba, Zona,

Hartford, and a great many more. But the most important and valuable seedling that was ever produced in the United States was grown by a gentleman in Massachusetts, whose name I cannot now remember, and who died not very long ago. It is the Concord, and its kinds which we have to rely on here in the Willamette valley, although in some places, as at Forest Grove, foreign kinds seem to do well. But the question is, which are the best and most profitable in the market. Our Concord, Worden, and Niagara, the first two bluish black, and the last named greenish white. Other kinds may have some very good points, but are not so reliable and profitable as the three named above. I say the main secret of growing good grapes lies in the pruning. This I will explain further on.

HOW TO MAKE A VINEYARD.

In planting a vineyard we first select a suitable place. This should not be too low nor too wet, where cold nights can do damage. The most suitable place for grapes are our hills, and the western and southern slopes thereof. Soil that produces wheat or potatoes is rich enough for grapes. After the land is well plowed and harrowed thoroughly, rows are marked off, seven or eight feet apart, to suit. Then good four-foot stakes are put in eight or more feet apart, as one wishes to plant his vines. I always recommend the vines to be planted seven by eight feet. This will require about seven hundred and fifty plants to the acre. The best time to plant is April or the first part of May. Dig the holes about three feet in diameter and one and one-half to two feet deep. Then fill up partly again with surface soil, and from a little hill in the center, around which the roots are spread when planting, and then fill up with surface soil. Then the stake is put back again near to the plant. Healthy well rooted one-year-old plants are preferred by most grapegrowers. During the first summer the young vines are well cultivated and kept clean of weeds, and when necessary are tied to the stakes. Something that does not interfere with the young plants may be grown between the rows. The second spring the young vines are cut back to two or three buds. In summer the young shoots are tied to the stakes. Good cultivation as in first year. Early in third spring wires are drawn for trellis. Two wires are enough, one about two feet above the ground, the other about two feet above this. The wires are fastened to strong posts set firmly in the ground and well braced. In the rows the wires are held up by strong seven-foot stakes. These are pointed on one end and firmly driven into the ground between every second vine, so there will always be two vines between. In pruning only one cane, the strongest, is left and cut back to about six or eight buds and tie to the lower wire. All the rest is cut away smoothly. This will secure a good, straight stem. In summer the young shoots will grow up and fasten themselves with their tendrils to the upper wire. There may be some bunches of grapes this year, but unless the vines are very strong the fruit should be pinched off. All shoots that appear within one and one-half feet above the

ground should be rubbed off as they appear. In the fourth spring two of the strongest canes are cut back to six or eight buds and tied in opposite directions to the wires, two canes are cut back to two buds for spurs, to grow bearing canes for the year after. All the rest is cut off smoothly. It must be kept in mind that only the young shoots from last year's growth will bear. All shoots that grow from older parts are not good. Soon the buds will sprout, and when long enough, the ends are pinched off, leaving one leaf above the upper bunch.

The upper shoot of the spurs and a few shoots of the lower part of the long canes should not be touched, as they are wanted for bearing canes next year. Soon the laterals or side shoots will appear. These are pinched off again the same way as before, leaving one leaf. This secures the growth of good foliage, which is necessary for nourishing the fruit and plant.

In the fifth spring, the vines should have grown large enough to bear a full crop. Three or four canes are now pruned to six or eight buds, and as many spurs of two buds are left. All the rest is cut away. The canes are tied to the trellis in the shape of a fan. The summer pruning is the same as the year before. The latterals perhaps will have to be pinched off. After the first pinching, leave one leaf as before. The long shoots for bearing canes may be shortened the end of July.

BEST GRAPE VINES FOR OREGON.

Grape vines at times are inclined to overbear themselves. Every sprout from bearing canes, as a rule, produces three bunches, but quite often there come from one lead two and three sprouts. One only, the strongest, is left; the others are taken off. On the stem below and other parts many young shoots will appear. These must be rubbed off as soon as they appear. In spring the vineyards should be plowed moderately deep, and well cultivated in summer, and kept clean of weeds. It is well for a beginner to visit the vineyard of a succesful grape grower.

This will help him more than anything else. The way of pruning I described here is called the renewing system. All the parts that have borne fruit are cut away every year, and new bearing canes from below take their place. There are other methods of pruning which have their good points, but in the run of time it will be found that the renewing system is the best. The pruning may be done any time during the winter, but it should always be finished before March. The tying should be finished before the buds sprout, otherwise they break off. The best material for tying is the golden willow. Before I close I will give a description of some of the most reliable kinds of grapes. The Concord hardly needs description. It is known by most everybody. The bunch is large and shouldered, the berries large, bluish-black, and of the fine flavor which most all Americans like so well. It is always sure to bear. The Worden is a black grape, like the Concord. Bunches large and heavy; berries large and somewhat better in quality. It ripens about ten days before the Concord, and is fully as productive. The Niagara

is a greenish white grape; it is perhaps the most productive of all our native grapes. The bunches are very large, the berries are large and sweet and of good flavor. It sells well in the Portland markets. The above named varieties are the most reliable, and sell best in the market. Moore's Diamond is a very good white grape of fine flavor, bunch and berries large and of fine flavor, but not as productive as the Niagara. It begins to ripen about two weeks before the Concord.

The Eaton has very large, heavy bunches; berries are very large, of good flavor, black. It sells well, but it will not bear shipment very well. The Green Mountain is an early white grape; bunches are long, berries are medium and very sweet; ripens about three weeks before the Concord.

The Vergennes is a red grape of good quality; bunch and berry large; a good keeper.

The Brighton is a red grape of fine quality, bunch large, berries medium, very sweet and delicious, and keeps well. It ripens the same time as the Concord.

The Lady Washington is a very fine white grape, that bears well; bunch medium, berries large, quality not as good as Niagara.

The Delaware does not belong to the last named class, but is too well known to pass it unnoticed; bunch and berries small, light red, very sweet and delicious flavor; bears well, but for the last couple of years it did not do well.

All of these named kinds are early enough for our climate here to get ripe most every year, and very seldom fail.

A few new kinds have been introduced lately, as Campbell, Early and McPike, both black, but so far they have not come up to the points promised, and must be tried a year or two longer.

THE GRAPE IN OREGON.

By Prof. E. R. Lake, Oregon Agricultural College, Corvallis, Or.

PART I.

WESTERN OREGON.

"In the desert it ranks next the pine."—Loudon.

The grape has been grown as a fruit for home use in this region for a period of over fifty years. The first vine planted so far as known was an Isabella, in 1848.* Yet, while the grape has been grown here over half a century, it is only within the past sixteen years that it has been considered as a commercial crop. Within this later period several small vineyards of the American type of grape have been planted, and the owners are finding them profitable investments. It is not the purpose of the writer, however, to urge the growing of the grape as a commercial crop at this time, but rather to endeavor to encourage the planting of it for home consumption. That the grape is one of the most healthful of the cultivated fruits, is attested by the fact that the consumption of this fruit has been, from biblical times to the present, endorsed and prescribed as a dietary food by eminent physicians; the vine and its fruit have also been the recipient of zealous attention by man, and at his hands have been wonderfully developed and meliorated. While the world at large is most familiar with the history of the European grape (Vitis vinifera) the history of the development of the American grape (Vitis labrusca, and other species), which is at present receiving much attention by specialists, is even more interesting to the American horticulturist than that of its old world congener, for the reason that, except for parts of California, Oregon, Washington and Idaho, and as a special type for indoor culture, the European variety is not suitable to American climatic conditions.

That the grape is highly esteemed by man is particularly evidenced by the great number of varieties that have been brought out by selection and hybridization. In 1768 Miller described eighteen varieties; in 1875, Hogg in his "Fruit Manual" listed one hundred and forty-three; in 1881, a Frenchman, M. Andre, catalogued four hundred and seventeen. These are lists of foreign authors.* In our own country there have been listed upwards of fifteen hundred† varieties of our native species, and the list is steadily increasing year by year. And yet with all this array of named and fully described varieties it has been found that only a few are really worthy of being planted in Western Oregon for either home or market

* Of the Henderson Lewelling collection brought across the plains in 1847.
* Barron, 1900.
† W. K. Newell, Oregon Report, 1899.

purposes. Those varieties which the experience of the past ten or twelve years in particular, have shown to be especially suited to the conditions of Western Oregon, as Concord, Worden, Moore (Moore's Early), Diamond (Moore's Diamond), Niagara, and Isabella are all varieties developed from Vitis labrusca;‡ while Deleware, which also does well in many localities, is a variety of Vitis aestivalis.§ Of the above varieties Isabella is the one planted by the pioneers and first setlers. There is scarcely a locality in which one can not find this variety growing, and among the "old homes" it is safe to say that at least ninety per cent of them have, among the plants in their fruit gardens, one or more vines of the Isabella; and though it occasionally fails to yield a full crop, often bears imperfect clusters, and is troubled with mildew, it is still highly prized by the family, especially for the making of jelly. In general it has received no more attention than the orchard trees and other fruit-bearing plants about the home grounds. A tree, fence, barn or other outbuilding too often is its support and on these it climbs and trails from year to year;|| in few instances has it received the much needed annual cutting back, and in most cases even the building of a trellis has not been sufficient to awaken the owner to the importance of liberal pruning.** With the recent planting of better varieties and the cultivation of small vineyards by men specially interested in this fruit, a very noticeable change in the appearance of the pioneer vines of Isabella has taken place.

Noting the effect of liberal pruning, proper trellising and the thinning out of surplus wood in the summer, many of the owners of old vines, some of which are reputed to have borne hundreds of pounds of fruit in favorable past years, and which formerly trailed unpruned over old buildings, fences, and trees, have removed the surplus wood, placed the vines upon suitable trellises, and are now giving them such treatment as our best growers recommend, with results that are very gratifying to themselves. Though the Isabella is no longer considered a desirable variety for table purposes by our specialists and the dealers, it is still worthy of some attention by the rural home-builder. It is especially hardy, quite vigorous and usually supplies, with a minimum amount of care, a fairly good crop of palatable fruit, more of which should be eaten by our people. It is an excellent variety for jelly-making, and grape jelly rates very high in the estimation of the American housewife; it is likewise one of the best varieties from which to make grape-must, i. e., unfermented grape juice, for which there is a steadily growing demand in one form or another.*

‡ Vitis labrusca, L., is the common wild fox grape of the extreme eastern United States. It is the parent of the best part of the American varieties and is well known through its offspring, Concord, Worden, Diamond, Isabella, Moore, Niagara and many others.

§ Vitis aestivalis, Mich., is the Pigeon or Summer grape. Its home is the southeastern part of the country and westward to the Mississippi and Missouri. It is the parent of many of our American varieties as Eumelan, Delaware.

|| See "The oldest vine in Lane county."

** See "The neglected home vine."

* The reader interested in this product of the grape is referred to Bulletin 130, California.

A FRUITING WORDEN VINE—FOURTH YEAR.

Though the progressive grape-grower of today would not recommend the planting of this variety for general home or market use, it were better that those who have vines of this variety growing on their property give them the best care and thus obtain a quantity of fairly good fruit than to destroy them before other and better varieties have been tested and become productive. By using care it is not necessary even to destroy the root system of the old vine that has become established, but it may be grafted with a better variety, in just the same manner that one would graft a tree, with this difference: the main stem of the vine should be cut off at a point three or four inches below the surface of the ground. If the grafts are inserted at this point in the usual manner of cleft-grafting and then the soil placed back over the wound little difficulty will be experienced in transforming the head of an old Isabella or other undesirable variety into one of more favorable qualities. This work of grafting should be performed while the vine is still dormant.

SOIL AND LOCATION.

Barron,† an English authority upon the grape, writing upon this topic says: "The vine is a plant which is found growing with extraordinary vigor under very opposite conditions and in soils of absolutely different composition. The physical condition of the soil is very much more important than the elements of which it is composed."

Phillip Miller, an English horticultural authority, writing upon this subject in 1768 made this statement: "An ideal soil for the grape is a light, loose, brownish sand, with coarse gravel, and at a depth of twenty feet, water."*

The experience of fifty years in Western Oregon has confirmed both of these views in so far as they do not conflict, i. e., as to physical conditions.

Our growers have found that the grape, at its best, delights in a deep, warm, mellow soil, but it is not unyielding in this respect, for it can be grown successfully in nearly all soils, if supplied with ample food substances, and the climatic conditions are such that the blossoms are not injured by frost in the spring or the fruit prevented by a low temperature from ripening in the fall.

As a rule the more successful growers of Western Oregon find the fir hill land or the sandy, loamy river bottoms best adapted to profitable grape growing. The heavy clays of the first and second benches are so cold that the fruit develops slowly and is frequently unable to ripen before the fall frosts and wet weather seriously injure it. Vines should be planted in such places as have good air drainage, or in places that are protected against cold air currents by the presence of a considerable body of water.

While our vineyardsists generally prefer a south or southwest exposure, there are profitable vineyards with western, eastern and southeastern ex-

† Vines and Vine Culture, 1900.
* Dictionary of Botany.

posure; and many small plantations for home use have no particular pronounced exposure and yet do well one year with another, when on relatively high well drained ground.

PLANTING.

The easiest and quickest way to get a vine to bearing age and size is to plant good, clean, thrifty, well-rooted one-year-old vines. If the cost of these should deter one, then take cuttings. These can be had, generally, for the asking of any reliable grower. One point should be well watched and that is to plant only the most generally approved varieties. The home grower should not attempt to experiment with varieties in his first plantings. The first endeavor should be to secure a few bearing vines of standard varieties. The work of bringing these to fruitfulness will usually result in awakening interest in the choicer varieties, and in due time one may indulge his taste for experiment by trying a few of the more promising new ones.

One step in the planting of a tree, shrub or vine that needs to be kept constantly in mind is the fact that one is planting a crop that will require years to reach its full development. Accordingly, the best of care should be given to the work of planting. A tree, shrub or vine well planted is half established. A common practice in Bavaria, when planting hops, is to thoroughly pulverize the ground to the depth of thirty to forty inches, and yet this crop is expected to remain only twelve to fourteen years, how much more thoroughly then should the soil be prepared for a crop that is to remain for a period of twenty-five to fifty years or even longer.

VARIETIES.

The first problem that confronts the one who would put out a few grape vines, is as to the varieties. This opens one of the questions upon which a very wide diversity of opinion generally prevails, but fortunately for the beginner, the consensus of opinion of our best growers upon this point, so far as Western Oregon is concerned, limits the number of first choice varieties for home use to the following: Moore, Worden, Concord, Diamond, Niagara, Delaware, Isabella, Green Mountain, Brighton. In many localities the Black Hamburg does excellently, and White Chasselas, Red Burgundy, Sweetwater, Black July, Muscatel, Red Mountain, Chasselas Fountainbleu, Muscat and a few others in favored localities and under proper treatment, as in the vicinity of Forest Grove, yield very good crops of choice fruit. It is best under all conditions to consult local growers before planting. Keeping in mind that what may be best for the man who grows grapes as a business may not be the most desirable for the man who would only plant for home use.

The late A. R. Shipley, writing in 1892, said:* "For the farmer who is planting for his own use I would recommend Delaware, Concord, Hartford and Isabella, and perhaps Herbert and Worden." Since that time Worden

* Oregon Report, 1893.

A FRUITING NIAGARA VINE—FOURTH YEAR.

has developed into a general favorite, while Hartford and Herbert have been eliminated from the home list.

J. H. Reese, writing the same year† named Concord, Delaware, Coloma, Eumelan, Pocklington, Salem, and Miles as varieties succeeding in the vicinity of Newberg, but in a recent letter he writes: "I hope no one has taken the above list as a guide to commercial planting. It was only recommended for home use. Nothing that we have thus far tried has been more satisfactory than Delaware and Coloma. The Concord is a most excellent variety but it is occasionally injured by early fall rains, owing to its lateness. We also find Lady a most excellent table grape but the vine lacks vigor."

August Aufranc gives as the leading varieties for his section, Salem, and as varieties for home and market uses, White Chasselas, Red Burgundy and Concord.

G. W. McReynolds, a successful grower in Lane county, finds Green Mountain and Diamond the best varieties for the higher altitudes, while Rev. D. E. Loveridge, of Eugene, finds that Worden, Concord, Delaware, Niagara, and Diamond are the best for the river bottom lands.

Quoting from some recent remarks by Mr. Loveridge, he says: "The Catawba, a late grape, and one that is highly prized in the East, is our best keeper. It keeps until Christmas and with good care may be kept later, but it only succeeds in favorable spots. To my taste the Diamond is our best grape. When ripe it melts like a lump of sugar in the mouth and is sweet all through."

F. A. Rueter, speaking of the varieties found best for wine purposes, as grown on the hills near Forest Grove, says: "I find Sweetwater, Zinfandel, Burgundy, Black Hamburg, Muscatel, Red Mountain, Chasselas, Fountainbleu, Delaware, and Muscat excellent for our purposes."

CULTIVATION.

For the first few years after the vines are put out they should receive thorough tillage. Not only should the soil be well plowed and harrowed or dug over in the spring, but it should be frequently stirred, especially during July and August. When the vines have attained the age of ten or twelve years they are quite able to get along without any especial tillage, providing rank growth of other plants is not permitted within a reasonable distance of them. In this matter, such indifferent tillage is only to be tolerated with the home vines. No commercial vineyard could be successfully managed in this manner, and while an easy slip-shod manner of tilling cannot be recommended if one would obtain the best results, it were better to have grapes on the home table, obtained from vines partially tilled, than to have no grapes at all.

PRUNING AND TRAINING.

The one persistent feature of growing grapes is pruning. To get satisfactory results from the vine this must not be neglected in the least.

† Oregon Report, 1893.

There are many styles of training, each adapted to some particular conditions, but with all, liberal and effective pruning must be followed if one is to secure good returns from his plantings. The generally accepted system of training for the American varieties is the trellis, while for the European varieties the stump system is as commonly practiced. In either instance well considered methods of pruning are adopted by the most successful growers. The method of pruning will depend upon the system of training. Undoubtedly for the general home grower the trellis will be the more suitable. This method, while involving a greater original outlay, has the advantage of requiring less after-attention, an important point with the one who grows this fruit as an incidental crop. The details of pruning are fully treated in the separate articles following.

The articles by Messrs. Coolidge, Broetje and Newell have been specially prepared for this bulletin. These men have all been successful growers of the grape and give the benefits of their experience in such a way that the home-builder, and other persons interested in this fruit, may readily grasp the important and essential features of grape culture both for home and commercial purposes. The different localities represented by these writers include the principal sections of Western Oregon, in which the grape may be successfully grown.

PESTS.

Like all other cultivated fruits the grape has its enemies, but thus far they cannot be considered serious drawbacks to its culture in Oregon. The powdery mildew appears in nearly every section of Western Oregon one year with another, but this is no longer held to be a serious pest and only menaces the crop of the home grower, for the commercial vineyardist duly attends to the work of applying the simple remedies prescribed for this trouble.

While the flowers of sulphur is still used as a remedy against this trouble by many growers, the more progressive commercial vineyardists are recommending the Bordeaux mixture for early applications and the ammoniacal solution for the later applications.

The ease with which the sulphur can be applied, and there being no compounding necessary, it probably will continue to be used for some time yet by the home grower in preference to the more complex copper solutions. Though if one be provided with a spraying outfit, it will no doubt be better to use the liquid preparations, since the same solution used for mildew on the grape may be used for various other fungous pests. Lodeman* advises four applications: First, about a week before the blossoms open; second, about a week before the blossoms fall; third, two weeks after second application; fourth, sometime between two and

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* Bulletin 76, Cornell.

† Professor Bailey in his "Evolution of Our Native Fruits" makes this statement in connection with a discussion of Vitis labrusca: "In its wild state it is very variable in size, color, and quality of fruit, and in size of cluster. Its berries tend to fall from the stem, and the 'shelling' of grapes in vineyards may be a lingering of this ancestral trait."

four weeks after the third application. Formulae for making both Bordeaux and ammoniacal solutions are to be found in bulletin 28 of this station.

The effectiveness of this sulphur remedy depends largely upon the temperature at the time at which the application is made. If the weather is warm much better results are had than when rain, or cold cloudy conditions follow. The material should be dusted over both leaves and fruit and the first application may be made when the mildew first appears; the second, in about two weeks, and future applications will depend upon the climatic conditions, and the persistence of the fungus.

Lately, since '98, some growers have reported the trouble known as "rattling" or "shelling." This trouble affects the fruit in such a way that it falls prematurely. In many instances not only is that part of the fruit which falls lost, but the beauty of the cluster being destroyed its market value is reduced and thereby even a greater loss is sustained.

In 1894, Lodeman gave this subject considerable attention and in bulletin 76 of Cornell, said: "It would appear that one cause which lies at the bottom of the trouble is defective nourishment, and all influences which aggrevate this condition may be considered as indirect or exciting causes." The subject needs further attention before a remedy can be proposed, as the real cause is yet to be ascertained.†

The mongolian, or Denny, pheasant is held by some growers to be as much of a pest in the vineyard as any of the fungi or insects. Being a shrewd bird he manages to secrete himself beneath the foliage and eat and destroy large quantities of the fruit. The damaged clusters often presenting the appearance, to the casual observer, of "rattles" cause much loss to the grower of fine fruit. Vigilance and a trusty shotgun would appear to be the only really efficient remedies against this foe of choice fruit.

The robin is likewise credited with doing serious injury to the grape crop, especially in the vicinity of Portland. His case is the more serious, since, in numbers, he greatly outranks the pheasant, and is generally held to be a friend rather than a foe, for the accepted reason that he destroyes large numbers of injurious insects, while at the same time there is no inducement to kill him for game purposes as in the case of the pheasant.

VARIETIES ON THE STATION GROUNDS.

The following varieties have been growing on the station farm since 1890. The records show that in all this time, though the vines have grown vigorously, and fruited abundantly, little mature fruit has been harvested.

Allen Hybrid, Amber Queen, August Giant, Agawam.

Burgundy, Boz, Brighton, Black Malvoisie, Black Hamburg, Black Eagle.

Concord Muscat, Campbell Early, Caserio Nori, Concord, Catawba, Creveilnor.

Duchess, Delaware, Dutchfield, Don Juan.

Eldorado, Eumelan, Excelsior, Early Victor.

Faith.

Gross Sapet, Gross Gilliam, Goethe, Green Mountain, Golden Pocklington, Gaertina.

Hartford Prolific, Herbert.

Imperial Seedling, Illinois City.

Jewell, Jefferson.

(Moore) Diamond, Magora, Muscat, Mamosa, Moyer.

Nectar, Niagara, Newberg, Naomi.

Oil noir, Oneida.

Pocklington, Purity, Peabody, Peerless, Poughkeepsie.

Rogers Hybrid, Royal Muscadine, Rose of Peru.

Secretary, Seedling, Salem.

Ulster Prolific.

Vergennes.

Warder, Walter, Wonder, Witt, Worden, Wilding, Woodruff, Wyoming, Wilder.

Zona.

Comparative notes on several of the American varieties have been made by Professor Coote and are herewith presented.

During the spring of 1890 about seventy varieties were planted. Owing to the poor condition of the soil, the plants made but little growth the first two years, although they were given good attention in the way of cultivation.

In the winter of 1893 the earth was removed from around each plant for a distance of three feet, to a depth of twelve inches. These trenches were filled up with night soil at the rate of about ten gallons to the vine, After three days the earth was replaced in position, not being again disturbed until spring, when the whole was thoroughly plowed, and the surface soil kept well stirred through the summer. Through the application of the night soil the vines made a growth of fourteen to sixteen feet in 1894, and through a liberal supply of stable manure every other year the vines have made a good development. The location is not a good one, owing to the exposure, which is western and open to the cool sea breezes that spring up during the afternoon and evening. Quite a number of the varieties have never fruited. The following notes were taken during the year 1897:

Allen's Hybrid—Bunches, long, thinly set. Berry, medium, very thin skin, nearly white, being slightly tinged with amber, transparent. Matures in favorable seasons from September 20th to middle of October.

August Giant—Not of any value in this location. Has not matured any fruit during the test.

Black Eagle—Matures from September 26th to the end of October. Bunches, moderately compact and long. Berry, small, black, carries a heavy bloom. Flavor, second quality.

THE WELL-KEPT HOME.

Brighton—A variety requiring a dry period at the time of blossoming in order to insure the setting of the berries owing to the lack of pollen. Berries, medium to large, light red, changing to dark red when fully matured. Not a desirable grape for this location.

Concord Muscat—Matures September 25th. Bunches, long, compact; berry, large, oval; skin, thin; color, a greenish white with delicate bloom; rich and sugary with a strong Muscat flavor.

Concord—An old well known grape. It has not matured well any year. Too well known to need any description.

Delaware Red—Matures September 30th. Bunches, small, compact, shouldered; berry, a little below medium, round; skin, thin; flesh, sweet and tender, rich; color, a light red. It carries a thin bloom.

Eumelan—A very dark red grape. Clusters, medium; berry, medium, covered with a heavy bloom. Matures September 10th.

Early Victor—A dark grape, cluster, medium; berry, small, good flavor, carrying a good bloom. Matures September 8th.

Eldorado—Bunches thinly set with berries above the medium; color, clear golden yellow; bloom, thin; high flavor, resembling that of a pineapple.

Gaertner—Clusters, large, moderately compact; berry, medium to large; color, light red; skin, thin; bloom, thin; flavor, pleasant and sweet.

Hartford Prolific—A variety that never fails to mature, generally, from the first to the middle of September. Bunches, medium; color, black. A few days after maturity the berries begin to fall. It might be valuable for home on account of its earliness and for this only, being one of the few early black grapes.

Jewell—Clusters, small; color, dark; flavor, good; matures, September 4th.

Moore Diamond—A light green grape of excellent quality; berry, large with good heavy bloom; matures September 25th.

Niagara—Matures, last of September. Bunches, compact; berry, medium, with a thin bloom; skin, thick; color, pale green changing to a pale yellow when fully ripe; flavor, very good.

Nectar—Berry, medium to large; color, dark, covered with a heavy bloom. Matures September 2d. Fruit of fair quality.

Moyer—Clusters, small. Berries, small; color, red; of excellent quality. Matures September 3d.

Poughkeepsie—A vigorous variety, very much resembling the Delaware. Matures September 13th. Clusters thickly set with small, very sweet berries of excellent quality. Color, light red; a good second early variety.

Purity—Not of much value on account of its lateness in maturing; bunches, small and loose; color, pale red, with a thin bloom; skin, thin; flesh coarse.

Secretary—Does not mature. Altogether too late a variety for this section. Bunches, large, moderately compact, well shouldered; berry,

large; color, black, with heavy bloom. It has all the appearance of being of a good grape in earlier localities.

Salem—Matures the last of September. Clusters, well shouldered. Berry, medium to large; color, pale red, changing to a deeper red in the sun.

Worden—Clusters, large, well shouldered, moderately compact. Color, black; berry, large, slightly acid; skin, thin; bloom, quite heavy. Matures September 20th.

Wyoming—Produces quite small compact clusters; berries, medium; color, red, very much resembling the Delaware, covered with a slight bloom; flesh, firm, sweet, pulpy, a little foxy.

Rogers Hybrid No. 9.—Matures September 20th. Clusters, medium to large, sometimes shouldered; berry medium; color, dark red with a heavy bloom; skin, thin; flesh, pulpy, sweet and altogether rich.

Peerless—A red grape, resembling Black Hamburg in color and shape. Matures September 18th; berries of medium sie; flavor not the best. Has all the appearance of being a good grape if placed under better conditions.

THE SOUTHERN WILLAMETTE VALLEY.*

In order to make the highest success of grape growing three essentials are to be observed: first, selection of variety; second, selection of location, and third, proper handling of the vines while growing and bearing.

Sixteen years ago, when I moved out into the hills south of Eugene, and told some of my farmer friends that I was going to devote one of the choicest spots of my limited area to a vineyard, they tried to dissuade me, at the same time informing me that they had tried grape-growing, and that on account of the cool summers, grapes would never get sweet and only in exceptional seasons could any grapes fit for table use be raised.

The variety generally grown at that time all over the Willamette valley was an Isabella seedling, with an occasional true Isabella, usually planted in the poorest places on the farms and never pruned or cared for. My first step, after preparing a warm sunny spot on the southeast side of a hill, was to procure from a vineyardist in Napa valley, California, plants of his best early grapes of the Vinifera or foreign type, and at the same time secure from an extensive grape grower of Western New York plants of his best American varieties. When the vines were three years old not one of my neighbors was so astonished at the large beautiful clusters of delicious grapes—red, white and blue—as myself, and when put on the Eugene market nine out of ten purchasers supposed they were getting California fruit.

The proper way to plant a vineyard is to have the rows run north and south, vines eight feet apart in the rows, and rows ten feet apart.

It has been my contention that in certain respects Oregon is the best grape country in America. In California the large foreign grapes, Chas-

* D. W. Coolidge.

selas, Black Malvoisie, Tokay, Muscat, Black Hamburg, and Cornichon grow to perfection, but on account of soil and climatic conditions our delicious high-flavored American varieties do not reach perfection.

In Western New York and along the lake shores in Ohio the finest Worden, Concord, Niagara, Diamond and other leading American varieties reach perfection, but on account of the severity of the winters and fungoid diseases prevalent in those sections, the truly delicious foreign grapes cannot be grown. In this Oregon of ours, side by side, can we grow Worden, Concord or Niagara equal to New York, Ohio or any other state, and to my taste the most delicious of all grapes, Chasselas, Black Hamburg and Black Malvoisie of the foreign varieties. In a few seasons have I succeeded in growing truly delicious Muscats, but, as a rule, Tokay, Muscats and Cornichon do not mature. These latter are black skinned, coarse grapes at best.

At the opening the selection of variety was placed first; possibly location should have been first, as experience has taught me that the foreign varieties do not succeed so well in the valley as on a hill location. A southeast exposure, protected on the north and west by timber, if possible, makes an ideal location. The American varieties do equally as well on the hillside as in the valley; but, although I have taken plants of the foreign varieties from my hillside vineyard and planted them in the valley, the quality of the fruit is not nearly so good, and mildew is harder to contend with. Whenever one plants a vineyard, give it the sunniest, warmest spot you have, provided, of course, that the soil is good. While it does not agree with my own taste, the local market shows a decided preference for the American varieties, as Worden, Concord, Niagara, Diamond, Brighton, Diana, Delaware, Catawba, Agawam and Lindley, and I would plant them in the order named. There is not a more delicious American variety than the Worden, which has many good points to commend it. It is the earliest American grape; berries and bunch large and of unexcelled flavor. It has some weak points too: it cracks and shells badly and takes the most delicate handling to get it upon the market in prime condition. The vine is quite vigorous but not quite so much so as the Concord or Niagara. I dislike to admit it, after what has already been said about the quality of Oregon grapes, but it is a fact, that the Concord does not attain quite the high degree of excellence that the Western New York or Ohio Concord possesses, but the Worden, Niagara, and in fact all other American grapes, really seem quite the equal of the same varieties in the East. As all know, the Worden and Concord are blue grapes, while the Niagara and Diamond are white or green American varieties. The Niagara is a most vigorous growing vine, an enormous bearer, and of very good quality if allowed to hang on the vines, ordinarily, until about the middle of October. Diamond is not quite up to my early expectations the berries are not so large as Niagara, but it is somewhat earlier, and should find a place in every garden. The preference among the consumers is for the blue grapes, however, and if one is planting for the market he will want more of the blue varieties. The Brighton,

Delaware, Diana, Lindley, Agawam and Catawba are all red grapes of truly delicious quality, but the poorest sellers of the three colors. The Lindley and Agawam do not perfectly fertilize and are always borne in imperfect clusters. This is also largely true of the Brighton. The Delaware and Diana, both delicious, are too small in berry for the trade, usually. The Catawba is so late that it ripens very imperfectly. These are the best American varieties that have come under my observation; while Moore's Early, Early Ohio, Eaton, Bacchus, Hartford, Wyoming Red, Woodruff Red, Pocklington, Clinton, Wilder, Early Victor and several others that I have tried are so inferior in quality and growth of vine as to make them almost worthless.

My favorites of all grapes grown in the Willamette valley are two foreign varieties, the Chasselas Neuschatel, a white or green grape of the sweetwater type; but much superior to it in both size of fruit and flavor is the Black Malvoisie. The former ripens very early on hill locations, usually by September 5 to 10, and the latter about the middle of October. The Malvoisie is a large blue grape, oval shape, and borne in large clusters. As remarked before, neither one of these reach the same degree of perfection in the valley as on the hillside. Another truly delicious early foreign grape is the Violet Rose. Its name is misleading, however, as it is a white or green grape; oval shaped berry, quite large; and large bunches. One favorable season Violet Rose was picked and the fruit was quite sweet on the fifteenth of August. It is a grape I obtained of James Varney, late State Inspector of Fruit Pests. This last variety has one serious drawback—it fruits very sparingly, even when an unusual number of buds is left. Black July and Black Catawba will both ripen in ordinary seasons, but they are not desirable in all particulars. It is only an occasional season that Muscat, Tokay or grapes of that class will ripen perfectly in the Willamette valley. I have experimented with many other varieties but have found none worth one's time except the above favorably mentioned ones.

Although one may have the choicest varieties planted in a most favorable location, yet if he fail to properly prune his vines the result will be far from satisfactory. Foreign and American varieties must be pruned radically different to obtain the best results. The foreign varieties should be stumped or trained low, while the American should be trained to a trellis. Both should receive the same treatment the first year, being cut down to about three buds, which are all allowed to start, and when the growth is four or five inches long all but one sprout should be rubbed or cut off and only the one allowed to grow the first season. If American varieties are planted and the vines have made three or four feet growth, erect a good substantial trellis by planting good cedar posts sixteen feet apart in the row; brace the end posts well, and stretch a lower wire, about eighteen inches above the ground, tightly on the posts; cut the vine so that it will reach about two inches above the wire; tie it securely to the wire as nearly perpendicular as possible. The second year allow only two buds to grow, training them horizontally to the lower wire.

THE FRUITING CONCORD VINE—FOURTH YEAR.

The following spring cut these two arms back to about three buds each. At this time stretch the upper wire to the trellis, about four feet from the ground. Train the strongest growth straight up to the wire, and one of the strongest growths of the side arms to the wire, allowing the other two buds to grow. The following season leave the two side arms three or four feet long, cut the two other limbs back to two buds, and cut the upright growth about two inches above the wire.

The renewal plan of pruning seems to give the best results. This consists in cutting out the old wood each year and training the last year's growth to the trellis. After the third year train side arms on the upper wire as well as the lower.

The foreign grapes need very different pruning. The first year the vine is treated just the same as the American varieties. At the end of the first season's growth plant a substantial stake and cut the vine to a height of eighteen inches and tie securely to the stake. The second season allow only three buds to grow. The following fall cut the three limbs back to two buds each. Ever after that cut back to one or two buds, and when the vine gets too thick cut out some of the old wood. After the vine is three or four years old it will have formed a substantial stump that will stand alone and the stakes can be removed.

In February, if the weather be good, after the pruning is done, spray the vines thoroughly with a strong Bordeaux mixture. Repeat the spraying with a weaker solution when the grapes are half grown. This is sufficient for American varieties. The foreign sorts will need to have a liberal application of flour of sulphur, about the first of August. This can be sprinkled on the vines by hand, taking care to get the sulphur all over and around the vine. The amateur grower will have to learn by experience whether or not another application of sulphur is needed. He will soon learn to know the first appearance of mildew on the vine or grapes. Right then is the time to begin sulphuring.

THE LOWER WILLAMETTE VALLEY—EAST.*

When I first came to Portland, I was told, upon inquiry, that grapes could not be grown here and that many unsuccessful efforts had been made. Having brought plants of a few varieties with me from Illinois, I planted them at Mount Tabor, together with other varieties that were obtained here. Some of the varieties proved to be quite a success. With the success of this small planting in view others became interested in the growing of good grapes, and as it had been demonstrated that only our native American grapes could be grown successfully here, I sent East for plants of over thirty varieties, only such as ripen before or with the Concord. With these plants a small vineyard was started near Milwaukie, Clackamas county, in the spring of 1891. Of these varieties some proved to be a decided success, while others were practically failures. Some of these latter varieties ripen from the first to the middle of Sep-

* J. F. Broetje.
† Moore—American Pomological Society nomenclature.

tember, while the Concord Niagara and others ripen about the first of October. This vineyard has been visited by hundreds of people who have expressed astonishment at seeing the vines laden with large perfect clusters of fruit—equal to that grown anywhere in the Middle states. There has not been a failure yet. The vines are strong and healthy, free from mildew or other disease, and free from insect pests, while plants of foreign varieties grown nearby have been entirely ruined by mildew.

In 1898 we began marketing the fruit the first week in September and ended the middle of November. The first part of the crop was sold at wholesale, price, four cents per pound; the remainder, for three cents per pound; none was sold for less, though grapes sold by others for less than these prices. The fruit of our American varieties grown here is much preferred by the people of Portland to that which comes from other sections of the country.

All the varieties of our American type of grapes have come originally from the wild grapes that grow abundantly throughout the Middle, Northern and Southern states, and they are generally divided into four distinct classes.

First. The Northern Fox Grape class, Vitis labrusca. It is the varieties of this class upon which the growers of this valley must chiefly rely. To this class belongs the Isabella, Catawba, Concord, Worden, Moore's Early,† Eaton, Niagara, Green Mountain, Brighton, Vergennes, Lady Washington, and a great many others.

Second. The Summer Grape class, Vitis aestivalis. Only a few of this class are good for the table, but they are valuable for wine. I have only one variety of this class, the Centennial; a dull yellowish white grape; a good bearer; bunches of good size; berries somewhat below medium, but sweet and delicious. Though it ripens with the Concord, it can be kept until the new year.

Third. The Riverside Grape class, Vitis riparia. I have a few varieties of this class. The Empire State, a white grape that bears well; bunches, long; berry, medium, very sweet. The Elvira, another white grape; wonderfully productive; bunches rather small, good for wine making. Then there are many hybrids among the various classes, some of which are very fine, as the Salem, Dindley, Agawam, Wilder and many others, but these are not so reliable and saleable as the Concord and the Niagara.

Fourth. The Southern Fox Grape class, Vitis vulpina. None of this class can be successfully grown in our climate.

Throughout our valley one sees on the sides of buildings, and in gardens many grapevines that always look sick and gray with mildew, except where they are sprayed and sulphured several times during summer. These are the varieties that are grown in California. They are of the foreign type, Vitis vinifera, and were originally brought from Europe. They cannot be recommended for planting in this part of the state. I have met many people, who have never thought about the different classes of grapes; their origin, habit and properties, hence this brief out-

line of the types and classes of the grape. According to my experience, at present, planters in the lower Willamette district, must rely mostly on varieties of the Labrusca class, and only those that have been successfully grown will be named here.

The Concord.* This is the grape for everybody, large strong-shouldered bunches of big, black, sweet berries of the fine native flavor that all Americans like so well. It is very productieme and always a sure bearer. Seven-year-old vines have borne more than thirty pounds each.

The Worden.* A black grape like the Concord; bunches large and heavy; berries larger than the Concord and rather better in puality; ripens about ten days before the Concord and is fully as productive.

The Niagara.* A white grape that bears well and regularly; bunches, very large and heavy; berries, sweet and of good flavor. This variety is gaining much in favor on the home market. It ripens about ten days before the Concord. It is the best of the white grapes.

Moore's Early.† A black grape; bunch medium; berry, very large, quality as good as Concord, but vine not quite so productive. Very valuable here on account of its earliness. It ripens nearly three weeks before the Concord.

Eaton. A very strong grower; bunch, very large and heavy; berries, very large, many an inch in diameter, black and of good quality. It sells well, but will not bear long shipment very well.

More's Diamond.‡ A very good white grape; ripens about two weeks before the Concord. Bunch and berry, large and of best quality; not so productive as the Niagara.

Green Mountain. A white grape; rank grower; bears well; bunch, long; berry, medium, very sweet and delicious. It ripens here about the first of September.

Vergennes. A red grape of good quality; bears well, and is a good keeper; bunch and berry, large.

Brighton. A red grape of very best quality; bunch, large; berry, medium, very sweet and fine; keeps well. Ripens the same time as Concord.

Lady Washington. A beautiful large white grape; bears well, but in quality not as good as Niagara.

Wyoming Red. A very handsome grape; bunch and berry medium of bright red color, sweet with strong native aroma. Ripens two weeks before the Concord. The blossoms do not fertilize well every year, and for this reason it is not a reliable bearer.

Delaware. Though not belonging to this class, it is so well known and succeeds so thoroughly under our conditions that I cannot pass it unnoticed. Bunch and berry, small, light red, very sweet, and of most delicious flavor. It is an abundant bearer.

The above varieties have been found to be the best and most profitable for our home market, and they are sufficiently hardy and prolific to be all that the grower can desire of them.

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*See plate. †Moore. ‡Diamond —American Pomological Society nomenclature.

HOW TO PLANT.

The vines should be planted in rows seven feet apart, and eight feet apart in the row. After the ground is well prepared and rows staked off, holes are dug about one and a half to two feet deep and three feet across. These holes are partly filled up again with top soil, in such manner that it forms a little hill in the center of the hole, then the roots of the vine are spread around on this, care being taken to have the vine in the center. After the vine is planted a stake should be driven beside it. During the summer clean and thorough cultivation should be given.

PRUNING AND TRAINING.

In the fall or winter following the first season's growth, all shoots are cut away except one, the strongest. This is cut back from two to four buds. The next summer the strongest shoots should be tied to the stake; the others should be cut away clean. The second winter cut away again all shoots, leaving only one, the strongest. This is cut off at a height of two feet above the ground more or less, according to its strength and size, and tied to a stake or wire, if wires have been stretched. The best and cheapest material for tieing the canes to the wires is the shoots of hte golden willow. All shoots that issue within a foot to a foot and a half of the ground, should be pinched off as they appear, in order to have a single straight stem and the canes thus be kept a sufficient distance above the ground. It is necessary to have the canes well up from the ground in order that the air may circulate freely under neath, and this also makes cultivation much easier. Of the shoots that come at the upper end of the cane,* leave three or four. These may be fastened, as soon as long enough, to the upper wire. They must not be checked in their growth. During the third winter two of the strongest canes are cut back, leaving four to seven buds on each, and tied to the upper wire, the other canes are cut back to two buds, these are intended to make bearing canes for the year after. If the vines are rather weak, the canes should be pruned shorter and tied to the lower wire.

In the spring of the third year, after the vines have been plowed and hoed, the young shoots will push out vigorously. Now come the most important and delicate operations to be performed, in the pruning of the vine. This is known as summer pruning, and is usually done with thumb and finger. The work should be commenced when the young shoots are about five or six inches long. One shoot of the spurs† and one shoot at the lower end of the canes must not be toucned, because they are wanted for bearing canes next year, all the rest are pinched off at the ends, leaving one leaf above the upper bunch. All the shoots that issue between the spurs and canes, and also all that issue on the stem below, must be rubbed off. Some buds occasionally produce two or three shoots; rub off all but the strongest. Usually the grape will bear three bunches on each shoot. Now suppose a vine was pruned to two canes with seven buds

* A cane is a growth of the previous year.
† A spur is a short branch of the original stem, two or more years old.

A STUMP-TRAINED VINEYARD AT FOREST GROVE.

THE POLE TRELLIS SYSTEM OF TRAINING.

each, and two spurs with two buds each, would make eighteen shoots; and, should each shoot bear three bunches there would be fifty-four bunches in all; this would be too much for one vine except it were very old and strong; therefore, the smallest and poorest bunches are pinched off, leaving only the largest and best. A vine in its third year should not be allowed to bear more than fifteen pounds. If some shoots have not sufficiently developed to be pinched, pass them by and go over the vines again a few days later. This early pinching of the young shoots tends to throw all the vigor of the vine into the development of the fruit clusters and leaves. This early pinching saves much of the strength and vigor of the vine, for otherwise the shoots grow long and hard, and the operation of pruning is more difficult. This operation of pinching the shoots and thinning the fruit results in a larger quantity and better quality of fruit. After blossoming, and the laterals or side shoots have come out from the axils of the leaves, the plants are again gone over and these pinched, leaving one leaf. If the last named laterals shoot out again they should be likewise pinched, leaving one leaf. After this last pinching little growth will be made. The shoots which are left untouched in the operation of pinching and which are designed to bear fruit next season, may be cut off at the ends some time during July or August. It must be kept in mind that the fruit should grow and ripen in the shade, and that it is the leaves that feed the fruit and the plant, and that the roots only furnish the water and some mineral matter. Many persons make a mistake in pulling away all the laterals besides many leaves in order, as they believe, that the strength of the vine may be forced into the fruit, and that the rays of the sun may shine on the bunches, and thus help to develop them.

The fourth year. At this age the vines are large and strong enough to bear a full crop. The pruning is the same as that of the third year, but instead of leaving two canes and two spurs, there may now be left three or four canes and as many spurs. Consider the strength of the vine and prune accordingly, longer or shorter, from six to ten buds to a cane. Vines that show lack of vigor may be pruned as in the third year. Care, however, should be taken not to overtax the vines, as they are apt to overbear and lose their vigor. Should the soil be rather poor and the vines look weak, use some stimulants, as potash or bonedust. Never use ordinary stable manure. Soils that produce profitable crops of wheat or potatoes are rich enough for grapes. Grapevines that have been bearing for eight years at Milwaukie have never tasted any fertilizer yet, and the vines are increasing in vigor every year.

THE TRELLIS.

Our grapes are all grown on wire trellis. Strong posts are set firmly into the ground, at the ends of the rows and well braced. Holes are bored through the end posts two feet above the ground; through these the first wires will be fastened; two feet above the first set of holes bore another

set for the top wire. The wires are then stretched tight and fastened at both ends. Then good strong stakes, seven or eight feet long, pointed at one end, are driven firmly into the ground between the vines in the rows. Commencing with the first stake in the center, between the first and second vine, the next stake comes between the second and third, and so on through the row. Place the stakes edgewise, so that a sharp corner faces the wire, then saw a notch about three-fourths of an inch deep, slanting downward for the wire to rest in. These notches must correspond in height with the holes in the end posts. Some use staples to fasten the wires.

THE LOWER WILLAMETTE VALLEY—WEST.*

No longer ago than 1898 it was a customary practice for the fruit dealers of Portland to import every fall a few cars of New York grapes. Happily this practice is no longer necessary. A few men have grown grapes in Oregon for many years and with such success that the culture of this fruit is now becoming general; with a full crop this year (1901), we will have grapes for export. Puget Sound and British Columbia still import Eastern grapes, thus it is seen that there is a nearby market for us to supply. It is quite probable also, that a considerable trade can be developed in California for our Concord grapes, as this variety is not grown there, nor is there any other variety that will take its place.

In planting a vineyard give first attention to selecting a suitable location. Most any of the hill lands of Western Oregon that have a southern or southwestern exposure and that are sufficiently high to be free from late spring or early autumn frosts, will do. Elevations between two hundred and one thousand feet are best, though lower land near the Willamette river is just as good. A very necessary point to keep in mind when making a selection is that the site shall be such that the cold air can settle to the ravine or valley below; this is a great protection against frost, and also, such land is usually naturally well drained. If the drainage is not naturally good then tile it; for a good friable soil is a necessity in grape culture. Should one have no other suitable place, then plant a few vines against the south side of a building or tight board fence.

PREPARATION AND PLANTING.

For the grape nothing is better than new land or clover sod; plow deeply; harrow thoroughly; then dig holes for each vine, twenty-four to thirty inches in diameter and sixteen to twenty inches deep, putting the surface soil and sod back into the bottom of the hole. Vines should be planted in rows seven or eight feet apart, and eight or ten feet apart in the row. This will require six hundred to eight hundred vines per acre.

The best time for planting is in April, and one year old vines are to be preferred. When planting trim off all ragged or broken roots and cut back long ones one-half to two-thirds, and cut back the stem to two buds.

* W. K. Newell.

Plant deeply, working fine surface soil carefully about the roots, then tread thoroughly with the feet until the hole is nearly full, and finish by spreading the earth from the bottom of the hole loosely over the top. When planted, set a strong four-foot stake an inch or so from the stem; always on the same side of the row so that they will not bother when cultivating.

Cultivate thoroughly from early spring until August 1 to 10. Cultivation after this latter date tends to prevent the proper ripening of the wood. The tools needed are a one-horse plow, a cultivator and a hoe.

PRUNING AND TRAINING.

The pruning the first year is plain sailing but after that it becomes more difficult, and the beginner should, if possible, visit some experienced grower and see how it is done, for it is very difficult to write directions sufficiently clear for a new hand to follow. As soon as the two buds left at the time of planting get long enough, tie the strongest one to the stake and rub off the other. Keep the new shoot tied carefully to the stake as it grows and rub off all latterals as fast as they appear. There are many ways of training the vine, but the fan shape on a wire trellis is my preference. If this method is adopted then the second spring the first season's growth must be cut back to twelve or fifteen inches from the ground, leaving the two top buds to grow, and rubbing off all other shoots and suckers as fast as they appear. Treat these two shoots just the same as the one of the first season.

The third spring build trellis. Use heavy cedar posts well braced at the ends and light posts every sixteen feet apart along the row. No. 12 galvanized wire, one twenty-four inches from the ground, the other fifty-two or fifty-four inches should be stretched tight on the posts. Then cut back the two canes of the second season's growth to three or four buds each and tie the lower wire, still keeping the main stem tied to the stake until strong enough to stand alone. Let two shoots grow from each branch of the vine, tying them to the wires as they grow out; when five or six feet long pinch off the ends. These should bear a few grapes, and will furnish the bearing wood for the next season. The fourth season four or five new shoots may be started for the fifth season's fruit, when the fourth season's canes are removed. This process is repeated each year, remembering, always, that the fruit is produced only on the new wood of the previous season.*

February is the best time for winter pruning; do not prune old wood after sap starts in spring. Summer pruning consists of rubbing off all suckers and superfluous buds and pinching back the shoots at the proper time. The shoots for next season's fruit should be pinched when they have attained a growth of five or six feet, and the bearing shoots (when the fruit has set) should have one leaf left beyond the farthest bunch

* On shoots which issue from canes of the previous year.
† This is the so-called "stump" system of pruning as practiced in California and also in Southern Oregon and at Forest Grove.

of fruit. If the vine is setting too much fruit remove some of it. If one does not wish to trellis just keep the main stem tied to the stake and headed down to twenty-eight or thirty inches, allowing bearing sheets to issue directly from it, and heading these shoots back every year to two buds.†

The expense of starting a vineyard is large; and is itemized about as follows: Land, $50 per acre; good, deep plowing, $2.50; harrowing, $1; digging holes, $15; stakes, $8; planting, $12; vines, $40.50; cultivating, first season, eight times, $8; hoeing, $3; tying and pinching latterals, $4; total for first season, $143.50 per acre. The second year, winter pruning, $2.50; cultivating, etc., for season, $20. The third year the trellis will cost $50, pruning, etc., $25, bringing total cost to $241. The vineyard should pay its own way after the third year, and be in full bearing by eight or nine years, when it should produce five tons or more of fruit per acre each year.

WHAT TO PLANT.

Among the best of the varieties that have been thoroughly tested in Oregon, are Concord, Worden, Moore, and Eaton for black grapes; Niagara, Diamond, and Green Mountain for white grapes, and Delaware and Brighton for red grapes. All of these varieties will yield well and ripen perfectly in a favorable season and cannot fail to give satisfaction, except that Worden will be found too soft for shipment.

Do not attempt to grow such varieties as Black Hamburg, Sweetwater, or Muscat; they are not well adapted to this climate.

THE MANUFACTURE AND PRESERVATION OF UNFERMENTED GRAPE MUST.

By Prof. George C. Husmann.

INTRODUCTION.

The use of unfermented grape juice is of very ancient origin, being undoubtedly as old as the art of wine making. The industry of manufacturing unfermented grape must on an extensive scale for a general market is, however, as yet in its infancy, as is exemplified by the diversity of the apparatus used in the various factories. Each manufacturer seems to have had a different conception and to have constructed his machinery according to his own ideas.

It is the purpose of this publication to describe the most economical and successful methods of manufacturing must and to discuss its uses and effects on the system, together with the outlook for the commercial success of the industry.

HISTORICAL NOTES.

Galienus, the Greek physician and writer, says (A. D. 131):

A good many Asiatic wines were stored in bottles, which were hung in the corner of the fireplaces, where, by evaporation, they became old and dry. This process was called fumarium.

The Greek had two kinds of wine—the protoplon, or first juice of the grape before pressing, and the denterion, or pressed juice. The Romans called them vinum primarium and vinum secondarium. Some of them drank the juice before fermentation had started, and called it mustum; after the must had been through a heating process (called reduction nowadays), they called it frutum; and when after long heating it had been reduced to one-half or one-third its original volume, they called it sapa. This was used by the Romans on their bread, and was the equivalent of what we now call syrup.

In Europe physicians often send their patients to the wine-growing districts during vintage time to take daily rations of unfermented must as it comes from the crusher. This, however, restricts its use to only one season of the year and to the immediate vicinity of wine districts or to individuals strong enough to undertake a journey.

Of late years extended efforts have been made to keep the must unfermented and put it up in such shape that it can be used anywhere and at all times of the year.

Until recently the use of must was almost exclusively restricted to medicinal purposes. Unrestricted use has been delayed on account of a lack of special knowledge underlying the principles of the process of manufacture and of skill in their application, resulting in many failures, thus making the production of a good article uncertain and very expensive,

and inducing some unscrupulous persons to use injurious preservatives to cheapen the cost of manufacture. It is well known that pure must is healthful and nutritious, but with the addition of chemical preservatives it becomes injurious in proportion to the amount and kind of preservative used.

COMPOSITION OF THE GRAPE.

The grape contains fifteen to thirty-five per cent of sugar (Balling's scale), about two to three per cent of nitrogenous substances, and some tartaric and malic acids. The skin contains tannin, cream of tartar, and coloring matter. The seeds contain tannin, amylaceous matters, and fat. The stems contain tannin, divers acids, and mucilaginous matter. The comparative composition of the different parts of the fruit determines the value of must made from any grape.

CAUSES OF FERMENTATION.

It is well known that grapes and other fruits when ripe have the invisible spores of various fungi, yeast (ferments), and bacteria adhering to them. When dry these are inert, but after the grapes are crushed and they are surrounded by the must they become active and begin to multiply. If the must is warm, the changes take place rapidly; if, on the other hand, it is cool, the change is slower. But in either case, if left alone, the organisms increase until the must ferments. The most favorable temperature for fermentation is between sixty-five and eighty-eight degrees Fahrenheit. Cold checks, but does not kill, the ferment. This fermentation, now commonly called the elliptic yeast, changes the sugar in the grape to alcohol and carbonic acid gas, and is the leading factor in converting must into wine; hence it will be readily seen that to keep unfermented must sweet, fermentation must be prevented, and to be salable the product must be clear, bright, and attractive.

METHODS OF PREVENTING FERMENTATION.

Fermentation can be prevented in either of two ways:

(1) By chemical methods, which consist in the addition of germ poisons or antiseptics, which either kill the germs or prevent their growth. Of these, the principal ones used are salicylic, sulphurous, boracic, and benzoic acids, formalin, fluorides, and saccharin. As these substances are generally regarded as adulterants and injurious, they should not be used.

(2) Mechanical means are sometimes employed. The germs are either removed by some mechanical means, such as a filtering or a centrifugal apparatus, or they are destroyed by heat, electricity, etc. Of these, heat has so far been the most practical.

When a liquid is heated to a sufficiently high temperature all organisms in it are killed. The degree of heat required, however, differs not only with the particular variety of organisms, but also with the liquid in which they are held. Time is also a factor. An organism may not be killed if heated to a high temperature and quickly cooled. If, however, the temperature is kept at the same high degree for some time, it will

be killed. It must also be borne in mind that fungi, including yeasts, exist in the growing and the resting states, the latter being much more resistant than the former. A characteristic of the fungi and their spores is their great resistance to heat when dry. In this state they can be heated to two hundred and twelve degrees Fahrenheit without being killed. The spores of the common mold are even more resistant. This should be well considered in sterilizing the bottles and corks, which should be steamed to two hundred and forty degrees Fahrenheit for at least fifteen minutes.

Practical tests so far made indicate that must can be safely sterilized at from one hundred and sixty-five to one hundred and seventy-six degrees Fahrenheit. At this temperature the flavor is hardly changed, while at a temperature much above two hundred degrees Fahrenheit it is. This is an important point, as the success of an enterprise of this character depends entirely upon the flavor and quality of the product.

Such a vast difference exists in the methods pursued in California and in the Eastern States that a description of each is here given.

PROCESS USED IN CALIFORNIA.

This method, as described in Bulletin No. 130 of the California Experiment Station, is in substance as follows: Only clean and perfectly sound grapes, preferably those having a high natural acidity, picked and handled when cool, should be used. This fruit should not be too ripe or the must will be too sweet and be difficult to clarify. The grapes are pressed immediately and the juice is run into clean, sterilized puncheons or other receptacles. If the must is fifty-nine degrees Fahrenheit or under, it may be left to settle for twenty-four hours or more. This rids the juice of most of the floating solid matter and facilitates subsequent filtering. It is then passed through a continuous pasteurizer (see Fig. 1) and heated to one hundred and seventy-five degrees Fahrenheit, and should come out not warmer than seventy-seven degrees Fahrenheit when it is run directly by means of a block-tin pipe into fresh vessels. For this purpose sterilized puncheons or other casks may be used, although casks or vats of metal, lined with enamel, would be better.

The greatest care must be taken to avoid contamination of the must as it flows from the pasteurizer. The ends of the block-tin pipe should be plunged into boiling water in changing from one package to another, and should not touch the hands or any exposed surface. The package should be closed with a sterilized bung as soon as full. After the must has settled some days, or even weeks, it is ready for filtering. This filtration is best accomplished by means of a filter so constructed that the must passes upward through the filtering medium under pressure. This filter consists essentially of two shallow bowls clamped together, mouth to mouth, with the filtering medium between them. The unfiltered must enters the lower bowl through the pipe on the right of the figure, passes through the filtering medium into the upper bowl, and makes its exit, when clear, through the faucet a little to the left of the middle of

the figure. The small faucet at the bottom of the lower bowl is for the purpose of cleaning the filter. Occasionally when filtration becomes slow, this faucet is opened for a few minutes. This allows the sediment accumulated at the bottom to escape and at the same time the entering must takes a rotary motion in the lower bowl, thus clearing off the surface of the filtering medium, so that when the clearing faucet is closed filtration proceeds as before. On a large scale a filter press such as is used in large wineries and in beet-sugar factories might be conveniently used.

The must should be bottled as it flows from the filter, corked immediately, and sterilized as soon as possible, preferably within twenty-four hours. On account of recontamination during filtering, a final sterilization must be made after the bottles are corked. This is accomplished by means of a bottle sterilizer.

A simple and efficient form of sterilizer is made as follows of a wooden trough, provided with a wooden grating placed about two inches from the bottom. The filled bottles are placed in wire baskets which rest upon the grating. The trough should contain enough water to submerge the bottles and be kept at one hundred and eighty-five degrees Fahrenheit by means of a steam coil beneath the grating. It requires fifteen minutes for the must at the bottom to acquire that temperature. For packages of other sizes it is necessary to make a test with a bottle of must in which a thermometer has been placed, in order to determine how long it takes for the entire contents of the bottle to reach the required temperature. Sterilization in bottles should be conducted at a temperature at least ninety degrees Fahrenheit lower than that reached in the continuous pasteurizer. If the final heating is higher than the first, it may cause a precipitation of solid matter, which will make the must in the bottles cloudy.

During the sterilization in bottles the corks are liable to be expelled by the pressure developed. To prevent this they may be tied down with strong twine. Must so sterilized will keep unchanged for years, or until the bottles are opened.

No matter how carefully all previous work may be done, there is still danger of mold germs getting into the liquid through the corks, especially if a poor quality of corks be used. This can be prevented by dipping the necks of the bottles into heated paraffin before putting on the caps or by sealing over the corks with sealing wax.

The quality and character of the grape must will vary greatly with the quality of the grapes used, and a pleasing effect may be had by the blending or mixing of the must of two or more varieties of grapes. The color of the must will always be white or yellowish, with the exception of that from such varieties as the Bouschets, which have a red juice. Red must can be obtained by a modification of the process described. If the must is allowed to pass through the continuous pasteurizer and flow out hot into a vat containing the skins of red grapes, almost any desired depth of color may be obtained, depending on the variety of

grapes used and the time during which the hot must is left on the skins. Must thus prepared differs in other respects than color from the white must, various substances, especially tannin, being extracted from the skins, making the composition more like that of red wine, but containing sugar instead of alcohol. In some instances such an article will be preferred for medicinal use.

METHODS USED IN THE EASTERN STATES.

The methods used in the larger plants of the Eastern States, principally in the Chautauqua district of Lake Erie, are as follows:

The grapes are run through a combined crusher and stemmer in the upper story of the building, passing through wooden chutes to three aluminum kettles directly underneath. These kettles have double bottoms, so that steam can be used for heating without coming in contact with the contents. They also have in them revolving cylinders which keep the crushed grapes thoroughly stirred while they are being heated to one hundred and forty degrees Fahrenheit. This heating and stirring aids in getting more color out of the skins, the relative amount of juice obtained per ton of grapes is larger, and the must has more of the ingredients and taste of red wine, without containing any alcohol. These kettles are filled in rotation, namely: As soon as No. 1 is full, steam is turned on to heat it while No. 2 is being filled. By the time No. 2 is full No. 1 is hot. Steam is then turned on No. 2 while No. 3 is being filled, and No. 1 is emptied and ready to be filled again.

Underneath the kettles are the presses, which are of the hydraulic type. Into these the heated contents of the kettles are emptied and pressed. They are on wheels, and are run backward and forward for filling and emptying in regular rotation. From the presses the juice runs through pipes to aluminum kettles underneath, similar to those in which the crushed grapes are heated, except that they contain no revolving cylinders. In these kettles the juice is heated to one hundred and sixty-five degrees Fahrenheit, skimmed, and run through a pasteurizer underneath at a temperature no lower than one hundred and seventy-five degrees Fahrenheit and no higher than two hundred degrees Fahrenheit. From the pasteurizer the must is filled directly into freshly sterilized five-gallon carboys, securely corked, and stored in the vaults until the juice has settled and cleared, after which the clear juice is carefully siphoned off, filtered, filled into bottles, and securely corked, undergoing a final pasteurizing in the bottles, as explained in describing the California method.

By the method just described a dark-colored liquid is made, usually called grape juice. Nine-tenths of the eastern musts placed on the market are of this kind. Should it be desired to make a lighter-colored smooth article, the process should be modified by omitting the heating and stirring before pressing, the crushed grapes being pressed at once.

Attention should be called to the fact that the leading defects so far found with unfermented juice placed on the market are that much of it is not clear, a condition which very much detracts from its otherwise

attractive appearance, and is due to two causes already alluded to—either the final sterilization in bottles has been at a higher temperature than the preceding one, or the juice has been improperly filtered or has not been filtered at all.

In other cases the juices have been sterilized at such high temperature that they have a disagreeable, scorched taste. It should be remembered that when an attempt is made to sterilize at a temperature above one hundred and ninety-five degrees Fahrenheit, one is treading on dangerous ground. Another serious mistake has been made in placing grape juice on the market in too large bottles, so that much of it becomes spoiled before it is used.

Grape must properly made and bottled will keep indefinitely if it is not exposed to the atmosphere or mold germs; but when a bottle is once opened it should, like canned goods, be used as soon as possible to keep it from spoiling.

HOME MANUFACTURE.

Friends who are fortunate enough to have a small patch, perhaps only an arbor, of grape vines often tell us: "We have so many grapes we do not know what to do with them." The surplus may be used to make unfermented grape juice. The following recipe will enable anyone to make it:

Use only clean, sound, well-ripened grapes. If an ordinary cider mill is at hand, it may be used for crushing and pressing, or the grapes may be crushed and pressed with the hands. If a light-colored juice is desired, put the crushed grapes in a cleanly-washed cloth flour sack and tie up. Then either hang up securely and twist it, or let two persons take hold, one on each end of the sack, and twist, when the greater part of the juice will be expressed. Then gradually heat the juice in a double boiler or a large stone jar in a pan of hot water at a temperature of one hundred and eighty to two hundred degrees—never above two hundred degrees Fahrenheit. It is best to use a thermometer, but if there be none at hand, heat the juice until it steams, but do not allow it to boil; but it in a glass or enameled vessel to settle for twenty-four hours; carefully drain the juice from the sediment, and run it through several thicknesses of clean flannel, if no other filter be available. After this, fill into clean bottles. Do not fill entirely, but leave room for the liquid to expand when again heated. Fit a thin board over the bottom of an ordinary wash boiler, set the filled bottles (ordinary glass fruit jars are just as good) in it, fill in with water around the bottles to about an inch from the top of them, and gradually heat until it is about to simmer. Then take the bottles out and cork or seal immediately. It is a good idea to take the further precaution of sealing the corks over with sealing wax, to prevent mold germs from entering through the corks. Should it be desired to make a red juice, heat the crushed grapes to not above two hundred degrees Fahrenheit, strain through a clean cloth, set away to cool and settle, and proceed the same as with light-colored juice. Many people do not even go to the

trouble of letting the juice settle after straining it, but reheat and seal it up immediately, simply setting the vessels away in a cool place in an upright position, where they will be undisturbed and the juice allowed to settle, and when wanted for use the clear juice is simply taken off the sediment. Any person familiar with the process of canning fruit can also preserve grape juice, for the principles involved are identical.

Must is a valuable product, and many pleasures and comforts may be derived from its use. It contains a large part of the valuable ingredients of both fresh and canned grapes and can be used in many more ways and for many more purposes.

USES OF UNFERMENTED MUST.

The uses of unfermented must are many. It is used in sickness, convalescence, and good health; as a preventive, as well as a cure. By the young, by persons in the prime of life, and by those in old age it is used at all seasons of the year, whether that season be warm or cold, wet or dry. It is used in churches for sacramental purposes; at soda fountains as a cool and refreshing drink; in homes, at hotels, and at restaurants as a food, as a beverage, as a dessert, and in many other ways. When people become accustomed to it they rarely give it up; hence the manufacture of grape juice will probably increase enormously as the years go by.

Dr. Miradow Minas, at Jerjew (Dorpat), experimented on himself with pasteurized must during fifty-three days, dividing the time into thirteen periods. He took the following daily rations of food: Water, two thousand one hundred cubic centimeters; meat, three thousand grams; tea, nine grams; meat extract, five grams; light bread, five hundred grams; sugar, eighty-five and thirty-eight hundredths grams. During the first two and the last two periods he took no must. In the third period he took three hundred cubic centimeters daily; in the fourth, six hundred cubic centimeters, and thus gradually increased the portion until one thousand two hundred and fifty cubic centimeters in the seventh period, which lasted five days, were taken. After this he gradually decreased the portion until two hundred and fifty cubic centimeters were used in the eleventh period.

The conclusions reached were:

Through the rational addition of pasteurized must to a satisfactory mixed diet the cleavage of protein in the body is diminished. The power to protect protein is due to the grape sugar present, and is dependent not alone upon the quantity of grape juice taken, but also upon the kind and amount of protein consumed. The richer the food in easily digested protein the greater the power of the grape juice to protect protein. With an abundant diet the more or less long continued use of pasteurized must tends to induce a gain in body weight. The material gained may consist of nitrogenous substance or fatty tissue. When three hundred to seven hundred and fifty c. c. of pasteurized grape juice is consumed daily the resorption of nitrogenous material is increased. When larger quantities are consumed (one thousand to one thousand two hundred and fifty c. c.) the resorption of nitrogen diminishes somewhat, but in all cases it is better than on the same diet without the addition of pasteurized grape juice. The consumption of three hundred to five hundred c. c. of unfermented grape must daily diminishes intestinal fermentation. Larger

quantities are either without effect on the intensity of intestinal fermentaion or by diminishing the resorption of nitrogen increase the amount of ether sulphates excreted in the urine.

It should be said in considering the results obtained by Minas, that practically the same favorable results attributed to the use of grape juice have been found to follow the consumption of cane sugar. It therefore seems not unlikely that the value of grape juice as a food depends chiefly on the sugars present, though it should be remembered that the agreeable flavor undoubtedly increases the appetite and very probably increases the flow of digestive juices. Furthermore, grape juice offers the sugars in a reasonably dilute as well as a palatable form.

A FEW GOOD RECIPES.

Grape Nectar.

Take the juice of two lemons and one orange, one pint of grape juice, one small cup of sugar, and a pint of water. Serve ice cold. If served from punch bowl, sliced lemon and orange add to appearance.

An Invalid Drink.

Put in the bottom of a wineglass two tablespoonfuls of grape juice; add to this the beaten white of one egg and a little chopped ice; sprinkle sugar over top and serve. This is often served in sanitariums.

Grape Punch.

Boil together one pound of sugar and half pint of water until it spins a thread; take from the fire and when cool add the juice of six lemons and a quart of grape juice. Stand aside over night. Serve with plain water, apollinaris, or soda water.

Grape Sherbet.

For eight persons, mix one pint of grape must, juice of lemon, and one heaping teaspoonful of gelatin, dissolved in boiling water; freeze quickly; add beaten white of one egg just before finish.

Grape Ice Cream.

One quart of must, one quart of cream, one pound of sugar, and the juice of one lemon.

Syllabub.

One quart of fresh cream, whites of four eggs, one glass of grape must, two small cups of powdered sugar; whip half the sugar with the cream, the balance with the eggs; mix well; add grape juice and pour over sweetened strawberries and pineapple or oranges and bananas. Serve cold.

Bohemian Cream.

One pint thick cream, one pint grape-juice jelly; stir together; put in cups and set on ice. Serve with lady fingers.

Besides the recipes just given, many more are enumerated by the manufacturers, such as grape ice, grape lemonade, grape water ice, grape juice and egg, baked bananas, snow pudding, grape gelatin, junket and grape

jelly, tutti frutti jelly, grape float, grape jelly, grape juice plain, grape soda water, and scores of others.

ANALYSIS OF GRAPE MUST.

The analysis of a California must, as published in Bulletin No. 130 of the California Experiment Station, and of Concord grape must analyzed by Mr. L. S. Munson, of the Bureau of Chemistry, United States Department of Agriculture, are appended herewith, and may be of interest:

	Concord.	*California.*
	Per cent.	*Per cent*
Solid contents	20.37	20.60
Alcohol	None.	None.
Total acids (as tartaric)	.663	.53
Volatile acid	.023	.03
Grape sugar	18.54	19.15
Free tartaric acid	.025	.07
Ash	.255	.19
Phosphoric acid	.027	.04
Cream of tartar	.55	.59

	Per case.
Cases of 1 dozen quart bottles	$4.50 to $6.00
Cases of 2 dozen pint bottles	4.75 to 6.25
Cases of 4 gallon bottles	5.00 to 6.00

The comparison between the two becomes all the more interesting from the fact that California musts are made from Vinifera, or the European grapes, whereas the commercial musts of the Eastern States are made almost exclusively from the Concord, a Labrusca, or American variety.

PRICES AND STATISTICS.

The average prices to consumers are as follows:

	Per case.
Cases of 1 dozen quart bottles	$4.50 to $6.00
Cases of 2 dozen pint bottles	4.75 to 6.25
Cases of 4 gallon bottles	5.00 to 6.00

One firm in 1901 used, in their manufacture, eight thousand gross of bottles. To fill these required one thousand tons of grapes, eight thousand gross of corks, one million, one hundred thousand caps, as many labels and wrappers, and sixty thousand boxes. In the Chautauqua district alone about three hundred thousand gallons of unfermented must was made in 1901, and all those engaged in its manufacture are enlarging their plants.

HOOD RIVER FRUITGROWERS' REGULATIONS.

The Hood River Fruitgrowers' Union is the oldest co-operative association of its kind in Oregon, and has been a prominent factor in the development of the large berry industry of that valley. It is now entering upon the eleventh year of its usefulness. It is governed by a few simple regulations, which we publish in answer to many inquiries for the same.

Following are the articles of incorporation and by-laws of the union:

HOOD RIVER FRUITGROWERS' UNION.

Article 1. The name of this corporation shall be "The Hood River Fruitgrowers' Union."

Art. 2. The objects of this corporation shall be to secure to fruitgrowers of Hood river valley and vicinity all possible advantages in the marketing of their fruit, as well as to build up a standard of excellence, and to create a demand for the same.

Art. 3. The principal place of business of this corporation shall be at Hood River, Wasco County, State of Oregon.

Art. 4. The capital stock of this corporation shall one thousand five hundred dollars ($1500).

Art. 5. The value of each share of such capital stock shall be five dollars ($5).

BY-LAWS AS AMENDED UP TO JANUARY 1, 1902.

Section 1. The name, place of business, capital stock and purposes of this corporation, are set forth in the articles of incorporation, which are referred to as a part of these by-laws.

Sec. 2. The directors of this corporation shall be five in number, who shall be elected annually, and shall serve until their successors are elected and qualified. They shall qualify as directors within five days after their election, and within ten days thereafter they shall elect from their number a president, vice-president and secretary. They shall also choose a treasurer, who shall be required to give bonds, with surety, in such sums as they may deem ample. They may choose a bank as treasurer without bonds.

Sec. 3. The directors shall have power to levy and collect assessments on the capital stock, the same to become delinquent in thirty days from date of notice in local paper of such assessment. The directors may sell such delinquent stock at public auction to the highest bidder for cash, first giving thirty days' notice of such sale in a local newspaper, such sale to be made at the door of the office of the union, in Hood River, Oregon.

Sec. 4. The directors shall employ such agents and other employes as are necessary to do the business of the corporation, and shall fix the remuneration.

Sec. 5. The directors may refuse to receive for shipment any fruit not considered prime for any cause. They may also refuse to receive fruit for shipment from any person who has not shipped with the union regularly heretofore during the shipping season for such fruit, when in their judgment the receiving and shipment of the same would be detrimental to the interests of the regular shippers of the union.

Sec. 6. The duties of the secretary shall be to keep all books and accounts and records of the corporation, and to keep the minutes of the proceedings of the directors' and stockholders' meetings, and to carry on all correspondence, and to perform such other duties as may be required by the board of directors.

Sec. 7. The duties of the president and vice-president shall be the same as are usually required of such officers.

Sec. 8. It shall be the duty of the treasurer to receive and pay out all funds of the corporation, and to keep a correct account of the same.

Sec. 9. The annual meeting for the election of officers and the transaction of other business of the corporation shall be held on the second Saturday in November of each year, in the town of Hood River, Oregon, at 10 o'clock a. m.

Sec. 10. The president shall instruct the secretary to call a meeting of the stockholders whenever in his judgment the necessities of the union require it, by giving one week's notice through the local newspaper and by posting notices in three conspicuous places.

Sec. 11. A majority of the stock subscribed, upon which all legal calls or assessments are paid in full, shall constitute a quorum at any stockholders' meeting, and no vote shall be counted which is not represented by one share of stock upon which all calls or assessments have been paid.

Sec. 12. These by-laws may be amended by vote of a majority of the stock upon which all calls or assessments have been paid in full, at any regular or called meeting, provided that notice to amend by-laws shall have been given in the call for the meeting.

Sec. 13. The board of directors shall have the power to fill any vacancies that may occur in their number.

APPLE PACKAGES.

Report of committee at Northwest Fruitgrowers' Association meeting at Portland, February 5, 6, and 7, 1901:

Your committee, to whom was referred the matter of uniform apple packages, respectfully recommend that the apple boxes of the association shall be of the following dimensions, inside measurements, namely: Eighteen inches in length; eleven and one-half inches in width; ten and one-half inches deep; containing two thousand one hundred and seventy-three cubic inches, and to be known as "standard." We further recommend the following size, to be known as "special": Length, twenty inches; width, eleven inches; depth ten inches; and that the ends of said boxes be

seven-eighths of an inch in thickness. We also further recommend that all former actions of this association relative to apple boxes be repealed. The above is most respectfully submitted. Signed: E. L. Smith, E. C. Emerson, S. L. Moore, L. A. Porter and G. W. Whitehouse.

Reaffirmed by Walla Walla meeting held January 28 and 29, 1902, by resolution as follows:

Resolved, That it is the sense of this meeting that the action of the convention of a year ago relating to the size of boxes used for apples be reaffirmed; and all the members of the Northwest Fruitgrowers' Association be urged to use the same.

This resolution is deemed necessary and important owing to the action of other fruit associations and of commission men and large buyers of apples, in using and recommending various and unnecessary sizes of boxes according to their different ideas on the subject. It being in our opinion absolutely necessary and essential to the best interests of the fruitgrowers to establish and use a "standard box," and experience having shown that the sizes adopted at Portland are perfectly satisfactory, fair and honest, we recommend that those sizes be re-endorsed and given the full sanction and support of the association.

THE OREGON STRAWBERRY.

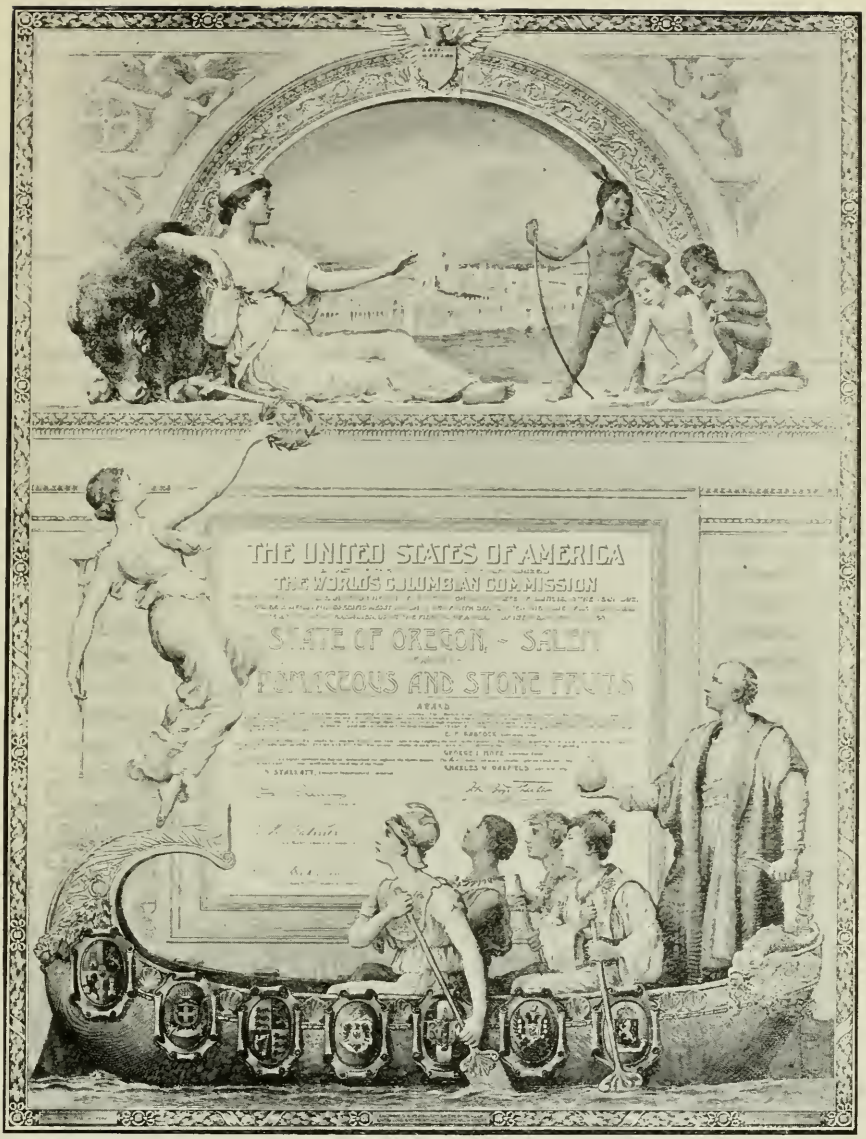
PAPER READ BEFORE THE MIDSUMMER MEETING OF THE STATE HORTICULTURAL SOCIETY, NEWBERG, OREGON, AUGUST 10, 1901.

By Hon. E. Hofer.

With practical control of the commerce of a hundred million people, with our shipping rapidly spreading to the navigable waters of the globe, with educated and civilized nations increasing in wealth and demanding the best fruits for their tables, there is a greater gold mine in the canned strawberry for Western Oregon than in the richest discovery of the Klondike. It means wealth, health and employment for the people of city and country.

Two articles can be grown in the Willamette valley in quality and quantity, and which our soil and climate will produce cheaply and surely, for which there is an unlimited demand when canned to meet the requirements of commerce—asparagus and strawberries. I am on the program for the latter, but have mentioned both on account of their universal consumption by well-to-do people the world over.

Willamette valley strawberries are destined to take the markets of the world—shipped fresh from fifty to five hundred miles without refrigeration and from one thousand to three thousand miles with cold storage—and canned in tin or glass to the ends of the world. This result will be achieved whenever the industry assumes commercial proportion.


THE UNITED STATES OF AMERICA
THE WORLD'S COLUMBIAN COMMISSION
STATE OF OREGON. - SALEM
AWARD

GOLD
SILVER
COPPER
IRON
COAL
ZINC
LEAD
PEACE-HATH-HER-VICTORIES-AS-WELL-AS-WAR.
NEW YORK
OREGON
COLORADO
MONTANA
GEORGIA
MEXICO
SWITZERLAND
ITALY
FRANCE
GERMANY
AUSTRIA
TRANS-MISSISSIPPI AND INTERNATIONAL EXPOSITION.
DIPLOMA
FOR
Gold Medal
Awarded
State of Oregon
To
For
Edward E. Bruce
Director

It was an inspiring sight that could be witnessed at the Salem cannery for six weeks this spring, to see a continuous stream of wagons drive up and unload berries. Two-horse wagons, one-horse wagons, buggies, dog carts, carrying from two crates to a ton of berries, for which three cents a pound was paid. The cannery paid as high as $300 a day for strawberries, and the money was distributed to a larger number of people than from any other one crop.

One cent a box is paid for picking, thus netting the grower two cents a pound. As from nine thousand to fifteen thousand plants are grown to the acre, and the yield of one quart to the plant is easily maintained, it is possible to figure out from $150 to $300 an acre for strawberries at the cannery. Stemming and grading the fruit at the cannery costs about one cent per pound.

But the cannery is not the only market for the crop. There is the home market if you are near a town and the shipping market that is always open and frequently more profitable than the near-by retail market or cannery.

A berry can be found adapted to almost any soil, to level or hill land, clay, gravel, or sandy loam, that has the qualities for a successful cannery, home market, or shipping berry.

In Western Oregon there is no trouble to grow large strawberries. The difficulty is rather to get varieties that are not too large—berries of medium size, that average well, are of regular shape, either round, or conical pointed fruit that look well in the box ready for the retailer. Avoid growing large and unshapen fruit. We should not be compelled to make two bites of a strawberry.

It is important to grow a variety that does not run out small after the first picking. That is the trouble with a great deal of the old Wilson stock—especially if it has been poorly cultivated, or has been allowed to get too many runners, or a dry spell of weather comes on—it suddenly tapers off to small unmarketable fruit. There is no better all-around berry than the old Wilson at its best, but some kinds hold up better in size.

For the home market grow a showy berry, above medium size—there are many good varieties like the Tennessee, Magoon, Saunders, Crescent, Jessie, Gaudy and others. The berry for the near-by retail market may be mild in flavor, white meated, unfit for canning or shipment, and yet be very profitable if it has a bright red glossy appearance, because in the stores and for hotels and boarding houses the demand goes mostly on showy qualities.

For shipment fresh an entirely different proposition is involved. A berry may be a perfect success for the home market and endure hauling several miles, and be entirely unfit for the express car or refrigerator for long-distance shipment. A shipping berry should be solid, have a good skin and fine texture, be of medium size, of roundish, pointed shape, and ripen several days after picking.

Clark's seedling, as grown at Hood River under irrigation and a crisp

mountain atmosphere, has the ideal shipping qualities. The same berry grows larger, redder, more delicious on the rich, sandy river bottoms of the Willamette valley, but will not stand shipping as far, although a Salem dealer had a telegraphic order for a carload from Sacramento this spring which he could not fill for lack of berries.

For the cannery we must look for still other qualities than for shipping, and I am a firm believer in the theory that the highest success in growing strawberries will be reached from specializing and growing the fruit for special purposes—for the home market, for shipment, and for canning, although one variety may have qualities for several or even for all these purposes.

By specializing we shall reach the highest development in quality, in stimulating special demands, financially, and in the improvement of the berry itself. For the cannery and to make a reputation for fruit that will take the top round in the market, we must cultivate for color, flavor, and firmness. Canned strawberries have been a drug on the market because only refuse has been canned.

A carload of some variety that was never grown for canning is thrown upon the market, after waiting several days it cannot be sold and it is rushed to the cannery. When it comes out of the can it is a whitish, bluish mess, no more resembling strawberries than the remains of a moundbuilder resembles a pretty, red-cheeked maiden, and the mess is about as appetizing. Compare such canned strawberries to a dish of the best Wilson, Clark s or Ideal, each berry full, round, and plump, keeping its shape, color, and flavor, and you have the difference between the ordinary canned product off the grocery shelf and the best fruit God ever made put up under favorable circumstances.

For the cannery we have not begun to do our best. Indeed we have done little or nothing, only the surplus, refuse, offal of the strawberry crop going to the cannery. I venture the statement that there has never been grown an acre of strawberries for the special purpose of having the fruit canned at its best—the variety selected, grown, and picked to be canned.

The industry is in its beginning. The most perfect canning varieties have not been introduced in Oregon. We have only begun to grow the Ideal and Ruby—two varieties that have the special qualities for a superior canned strawberry—tartness, high color, red clear through, solid flesh, and holding color and form after being cooked in the cans.

The Ideal is our most hopeful canner, a perfectly round, solid-fleshed, elastic-skinned, medium-sized fruit, perfect flowering and frost proof, holding up in size to the end of the season and very early.

The Ruby has all these qualities but is one of the latest varieties, is a large, heart-shaped fruit, a tremendous bearer, producing on one plant three hundred and sixty-five berries and bearing after all others are gone.

Both these berries are solid enough for shipment, and bright enough in color for the home market, if needed for that. Both have a skin that holds the pulp in shape cooked, one being very early and the other very

late, they promise well to plant together to prolong the picking season. The Ideal has one quality that I deem most important to the cannery product—its superb color after it is canned.

We tested the Ideal for color, flavor, and firmness before a committee of the Salem Chamber of Commerce and growers, by emptying a can each of the best California, the Hood River, and the best Wilson from the Salem cannery, put up in the same weight of syrup—and the Ideal surpassed all the others. It grows perfectly on heavy land which Clark's Seedling will not do with us. I do not speak of this to boast on other varieties, but to emphasize the possibility of putting up in Western Oregon, without irrigation, the best strawberry in the world—and that reputation once established means millions of wealth annually for this section, and employment for our people at a time of year when there is no other fruit or grain crop on our hands.

The strawberry, cherry, and other small fruit crops have already been such a stimulus to the season in which they come to maturity that the merchants say the dull season in early summer has given way to the greatest business activity, and in the same way the extension of this industry will produce continuous prosperity, where as in the land of Canaan the harvest shall extend into the vintage and the vintage into the seedtime.

Still the greatest revolution will come about in the strawberry industry when we have produced the self-stemming variety, as we have already several that leave the hulls on the stems when picked and come off perfectly clean like a raspberry. The Ideal variety does this. It may well be called the Oregon Ideal, because here it has attained the highest perfection, and when perfectly ripe will pick off clean without hulls or stems. Look at the importance of this improvement from a commercial standpoint:

(1) All the fruit would be of even quality of ripeness; (2) it would not have to be stemmed at the cannery, saving half a cent a pound to the grower; (3) it could be graded when picked by having a flat tray with a partition so that the two sizes could be kept separate, saving another half cent a pound for grading; (4) the fruit would not be mussed up from handling at the cannery as it is by stemming and grading; (5) a canning plant could quadruple its pack on such a strawberry, as now four or five hands can cook and solder what it takes a hundred hands to stem and grade; and (6) a vastly superior output in quality of canned berries. This is not idle theorizing, as the shuckless strawberry is no longer a novelty, but exists in a number of varieties.

What has been done at Hood River, where land and labor are expensive, can be done to much better advantage at Newberg, Salem, or any point on the railroad in the Willamette valley, where with cheaper soil, more available labor of families, no expense for irrigation, markets near by, and north and south of us, everything favors this industry.

For strawberry culture, we have most favorable environment and indigenous conditions, a population in villages, towns, and cities, and for

miles into the suburbs that are already accustomed and adapted to the industry, a combination of circumstances favorable to the greatest prosperity. It is not like flax fibre, sugar beets and other industries, that would require importation of coolies, or European peasantry for its success.

The Willamette valley is happily situated to dispose of any quantity of fresh strawberries, as our crop comes in after California supplies are exhausted and before the northern markets can get home supplies. As a matter of fact all middle and southern California is destitute of such strawberries as can be grown in Western Oregon. The berry or vegetable grown without irrigation surpasses in color, high natural fruit flavor, and firmness any produced under water. This has been demonstrated so often as to need no argument, and it can be safely asserted that this is naturally, for excellence, the strawberry paradise of the world and we are fools not to enter therein.

Do not spend much time on pests and diseases, beyond reading the bulletins and literature sent out by plant growers. The strawberry is most free from pests, blight, rust, mildew, diseases, etc., of any fruit that grows. I get packages of plants from the East regularly inspected and pronounced free from pests by some state board of horticulture that are regularly full of crown borers, but they always disappear under one season of our climate and editorial elbow grease.

But do not imagine you can succeed in strawberry growing without patient concentration upon the fundamentals and details of the business. First come the soil conditions, of infinite variety, and most profitable of all to be mastered, even to sending samples to the government experiment station for analysis.

Have the land rich. Plow the land in the fall and then work only a few inches of the surface in the spring; or plow in the spring and make the ground solid by rolling or the tramping of horses. One secret of success is to have "solid bottom," no large cavities nor very loose soil.

Out of ten to twenty new varieties tested each year, purchased of the best originators and specialists in the East, I find but few varieties of any permanent value. I have sought the qualities we are most badly in need of here in Western Oregon—color, acidity, flavor, and my notes taken from my experimental grounds commend the following new kinds:

Oregon Ideal. Already described as best for commercial canning.

Clark's Seedling. Best only on sandy soil.

Joe. Bright red, large conical fruit, mild flavor, home-market berry.

Lloyds. Dark red, long, flat fruit, early and acid. Excellent home garden variety.

Kansas. Very red, round, blunt-nosed shape, high degree of acidity, early and good medium size. Will prove a good shipper.

Double Cropper. Perfect cone shape, acid, dark glossy red, very early, good shipper.

Du Maurier (French). Self stemming, fine creamy flesh, mild, finest table berry.

Marguerite (French). Bright red, regular shape, fair size, good for home market.

Downing's Pride. Orange red, late, beautiful for home market, good shipper, but not vigorous grown on some soils.

Beverly. Bright red, round cone shape, good flavor, fair average size.

Lunshire. Large, late, showy red, medium quality. May be good home market berry.

Sample. Most prolific and promising of 1901 tests, dark red, good flavor, round, and blunt point, medium early.

I do not recommend any of these except for the qualities stated. I advise those who would go into strawberries to master the literature of the subject, study your soils, study your varieties and adopt such as meet your conditions.

It is safest and best to buy some plants of such varieties as have the qualities you seem to want, test them, and grow your own plants. Plants from the East are too small to be worth putting out on a large scale. Too many plants are set out that came off bearing stock in field culture, and in violation of the plain fact that you cannot raise a good crop of fruit and plants on the same vine.

By growing your own plants you can set them out early in the fall under most favorable conditions and often get more than half a crop of choice early fruit off a baby plantation. Set out some new ground each year. Get one or two good varieties and stick to them. Market only selected fruit. Find some way to utilize small and defective fruit besides marketing.

Co-operate with your neighbors, form a fruitgrowers' union to secure a standard of quality for your section. That is a great secret of success, for having established a standard and maintaining it, that is the best advertisement of your crop and of your neighborhood. The strawberry patch is the connecting link between town and country, between city and suburban homes, the golden road to industrial emancipation for the white-faced inhabitants of rented houses, giving employment to the largest numbers in field and factory, helping the multitude to get and keep the most sacred and beautiful thing in this world—a well-furnished American home, supported by honest, health-giving industry of old and young.

COVER CROPS IN THE ORCHARD.

PAPER READ BEFORE THE MIDSUMMER MEETING OF THE STATE HORTICULTURAL SOCEITY, NEWBERG, OREGON, AUGUST 10, 1901.

By L. T. Reynolds.

For several years the writer has been interested in the subject of cover crops in the orchard, and has become convinced that the sowing of some crop which would occupy the ground during the winter season would prove of great value in nearly all the bearing orchards of the Willamette valley.

Our long summer season, during which the ground is kept fallow, and the nitrogenizing organisms are storing available plant food, is followed by a long, rainy season, which must result in the loss of much of this food unless we can succeed in growing some crop during this period when the trees are dormant, which will take up and hold these fertilizing elements until they can become available for the use of the tree. The stunted growth and sickly, yellow appearance of the trees in many of our cultivated orchards, bear witness that there is need for a nitrogenous fertilizer.

The constant summer fallowing of the orchard soon results in the destruction of the humus and the soil is no longer loose and moist, but we find it baked and dry, usually covered with large clods which cannot be easily reduced. In our experiments we have tried crimson clover, turnips, rape, and vetch. Our first sowing of crimson clover was in September, 1896. By November 1st, we had a fine stand in the orchard and were anticipating a crop to plow under. Our hopes were doomed to disappointment, for the severe frosts in the latter part of November did not leave a plant. Our next trials were turnip and rape. While these flourish and give a large amount of green vegetable matter to turn under, yet they have not proved desirable, since we can obtain from some of the leguminous plants an equal amount of foliage and at the same time succeed in making available an increased amount of nitrogen.

On further trial of the crimson clover, we found it possible to obtain a fine growth in time to plow in, early in the spring, but it is rather difficult to obtain a good stand. The common vetch, however, has been bound to meet all the requirements. It can be sown later than crimson clover, is nearly always a good stand, makes a good growth during the winter and pushes forward rapidly in the spring, so that one can have a growth of two or three feet in height to turn under by the first of May.

A single vetch plant taken May 1st from the field of a neighbor, who sowed his vetches after his potatoes had been dug, stood over three feet high and being carefully removed, was found to have roots which had penetrated the ground twenty-seven inches.

In order to secure the best results, the vetches should be ploughed under as early in the spring as possible. The vines will then rot rapidly and the soil will retain its moisture.

It has been said, "The cheapest manure a farmer can use is clover seed." And we may say the cheapest manure a fruitgrower can use is vetch seed. For while the vetch is storing up nitrogen for the use of our fruit trees, it is also gathering phosphoric acid and potash from the soil and rendering them more available for the use of the roots of the trees.

As the luxuriant growth renders it somewhat difficult to plow in, we have found it convenient to sow the seed only one way between the trees, leaving about three feet in the tree row unsown. This plan makes it possible to use a one-horse plow without difficulty. Sown in this way, fifty pounds of vetch seed is sufficient for an acre.

As is well known, the Petite or French prunes have been very small for several seasons. We believe there would be less complaint in this regard, were leguminous plants more frequently grown in the orchards as cover crops, and the trees further assisted by liberal applications of potash.

Prof. Bailey, in his "Principles of Fruitgrowing," gives the following ways in which the cover crop may improve the soil:

"It directly improves the physical condition of the land. Prevents soils from cementing or puddling. Holds the rains and snows until they have time to soak away into the land. Dries out the soil in spring, making early tillage possible. Sometimes serves as a protection from frost. It improves the chemical condition of the soil. Catches and holds some of the leaching nitrates. Adds humus. Renders plant foods available. Appropriates nitrogen, if it is leguminous."

POMOLOGY.

PAPER READ AT THE ANNUAL MEETING OF THE STATE HORTICULTURAL SOCIETY, PORTLAND, JANUARY 13, 1903.

By E. L. Smith, President State Board of Horticulture.

Horticulture has been styled "the perfection of agriculture," and may it not also be said that pomology, which in its broader sense includes not only the science but the practical operations of fruitgrowing, is the perfection of horticulture.

The possibilities of pomology, through hybridizing and persistent plant-selection, are practically unlimited, and the aesthetic taste finds few things more beautiful, in the floral world, than the nature-painted petals of the apple or the immaculate white of the cherry blossom. I pass by the beautiful scarlet of the summer berries, the royal purple of the grape and the glorious colorings of our autumn harvests that not only delight the eye, but contribute to the comfort and health of the human race.

How pleasurable the companionship of nature in her varied and interesting processes of plant-breeding!

With my penknife I cut a single bud from a fruit twig and insert it under the bark of a limb of a tree bearing a different variety of fruit. The bud grows and in due time produces fruit unlike the rest of the tree, but like that borne on the tree from which it was taken. I continue the process and insert the buds of fifty varieties on this same tree and no two produce fruit alike, each variety retaining the characteristics of the tree from which it was taken.

Pray tell me what wonderful alchemy is this that takes from the earth its solvent salts, carries them up to every leaf, digests, separates and returns them to bark, fiber and fruit; paints these fifty apples in different colors of green and crimson and gold, here a splash of carmine on a field of yellow, there crimson stripes or dots of aureole, and greater wonder yet, giving to each distinct and different flavor, aroma and season of maturity. No miracle more wonderful than this of Dame Nature's in the plant world.

I take my penknife again and transfer a little grain of pollen dust from the anther of a blossom to the pistil of a flower of another variety. This flower matures its fruit and no marked effects are noted, but the little grain of pollen has done its work and potent changes are locked up in the seeds of this fruit.

Plant these seeds, and when they have grown and blossomed and borne fruit you will find in modified form the characteristics of the tree from which the pollen dust was taken, and again we record a miracle.

Pomology is largely indebted to hybridization for many of its choicest varieties, but the process is a slow one and impossible to the impatient man, and it is only under the intelligent and skillful manipulations of a Burbank, that a Gravenstein becomes a Winterstein or a sugar prune evolved that bids fair to replace the French, or some floral wonder from a despised weed of the wayside.

We want more light on this matter of cross-pollination. The literature on the subject is sadly deficient, so far as practical orcharding is concerned. Fletcher has written briefly, and we know that the Spitzenburg, Winesap, Bellflower, etc., among the apples, and the Dutchess, Bartlett, Clapp's Favorite, Winter Nellis, among the pears, are practically self-sterile.

But where shall I find a record of the simultaneous blossoming of trees, for pollination is impossible unless stamens and pistils mature at the same time? What shall I plant to fertilize my Spitzenburgs? I grow Newtown Pippins, but they blossom later than the Spitzenburg. I have Baldwins rich in pollen, but they bear fruit in alternate years and would therefore pollinize my Spitzenburgs only every second year. I might take Ben Davis, but I seek to grow apples of higher quality, and will have none of it. We need light, more light on this important subject.

I cannot pass this matter of cross-pollination, to which I have made

but mere reference, without calling your attention to some of the conclusions of our most experienced pomologists.

It has been demonstrated that no matter how rich in pollen a variety may be, the vigor of growth and size of fruit is increased by cross-pollination, and again, the same law that governs the in-breeding of animals follows the in-breeding of fruits, fertilized by their own pollen, resulting in decreased size and weakness of growth. I pass to a second necessity of pomology, namely methodical and persistent selection in the breeding of our nursery trees. Taking the apple as a type, we find countless varieties producing fruit of every conceivable size, color, taste, and season of ripening. Many of the old varieties are disappearing and only those of greatest merit have survived. Our Newtowns, Spitzenburgs, Bellflowers, and Russets were yielding their precious harvests more than a hundred years ago. What care have the children of this noble ancestry received as they came down to us through successive generations?

Has there been a careful selection of buds and cions from trees of greatest vigor and well-known productiveness to be grown on stocks of like health and vigor? We are all aware of the variableness of trees of the same variety. I walk along my rows of Newtown Pippins, that king of apples, and here and there I find a tree bearing undersized, colorless acid fruit fit only for the vinegar vat.

Experience has demonstrated that cions cut from such trees will also bear inferior fruit and that parentage is just as important in the vegetable as in the animal kingdom. What grower marks his trees that for successive years have borne his choicest fruit that cions may be cut from them alone?

Who does not know that cuttings are taken indiscriminately from trees bearing good, poor, and indifferent fruit and that this process has been going on for generations? And what shall we say of our seedlings or stocks that are to grow these buds and cions for our future orchards?

Did we select the seeds from the fruit of hardy, healthy trees, or did we wash them out from the pomace that came from the cider press? And pray what kind of fruit do we take to the cider mill? Do we not all know that it is the colorless, undersized, unsalable fruit that goes there, and yet we breed our trees on stocks grown from the seeds of this miserable trash? If the owners of our flocks and herds paid as little attention to parentage as we fruit men do, would they not have a mongrel lot? I believe in this manner: We have impaired the constitution of many of our best varieties and to get best results must top-work them on trees of greater vigor.

At Newtown, on Long Island, the home of the original Newtown Pippin, there is standing to this day a tree of that variety planted more than one hundred and fifty years ago. I believe that through careless breeding we have shortened the longevity of our trees, our orchards are short-lived and considered old when they have borne for twenty years. Can we restore the old-time strength and healthfulness of our trees, is a question of no little concern to all pomologists.

To a large extent, I answer yes, but we must revolutionize our methods of propagation, must have our pedigree trees and breed from strains of excellence just as the stockman does. No bud or cion cut except from strong-blooded trees with perfect growth of trunk, limb, leaf, and fruit, so that in future years we may not only boast but base our values on the ancestry of our orchards.

IMPROVING AN ORCHARD.

By Fred W. Card, Kingston, R. I.*

Apples are scarce. They are never too plenty, except for the man who sells; they are often too few. Many orchards bear worms and "moss"; few bear apples that are worth the eating. It costs more to grow apples than to grow worms. Will it pay? Perhaps; perhaps not. It may or may not pay in current coin. It will pay in rosy cheeks, laughing eyes, and happy children. It should pay in both ways.

The Rhode Island Experiment Station was given permission to manage a neglected orchard in 1899. It was a home orchard of something less than an acre, containing many varieties, which had been planted about twenty-five years. When work was begun the trees looked very unpromising; they had made little growth, and the trunks were covered with lichens, or "moss." No fruit of value had been produced for several years. The treatment given it by the station was such as any farmer might afford.

The first thing done was to scrape off the rough, loose bark from the trunks and branches, and prune the trees. This rough bark may do little harm, but it denotes lack of thrift and affords a harbor for insects. The pruning was simple in this case; only dead branches and crowding suckers were removed. How much to prune in other cases will depend upon the condition of the trees. If they are old and decrepit, with dying branches and failing strength, pruning should be vigorous. An apple tree can be renewed like a grape vine. A wealth of suckers is its signal that such renewal is needed. In extreme cases a tree may even be cut to the ground and another built upon a young shoot which springs up. This is seldom demanded, but with old trees which have lost their vigor, whose branches are diseased, and which have made but little growth, quicker returns and better fruit may come from heroic treatment. Cut out the old branches ruthlessly. Leave vigorous young suckers to take their place. A new top will quickly form, and better fruit will result. If trees are not so far on the decline, such pruning will not be needed. It may then be confined to thinning out useless branches. Sunshine and air should have free access.

Apples contain plant food. The tree must be fed to produce them. Some soils are strong enough to produce crops year after year without manure; most soils are not. The soil of this orchard is light and sandy.

* Field work in charge of G. E. Adams.

Fig. 1.

Fig. 3.

HOW MUCH TO PRUNE WILL DEPEND UPON THE CONDITION OF THE TREE.

Fig. 2.

THE TRUNK AND BRANCHES WERE COVERED WITH "MOSS."

Fig. 4.
THE TREE MUST BE FED.

Fig. 5.
FOLIAGE FROM A TREE RECEIVING MODERATE CARE AT LEFT; FROM A NEGLECTED TREE AT RIGHT; REPPRESENTING THREE AND NINE YEARS' GROWTH, RESPECTIVELY.

The trees had made a minimum growth; they needed food. Fertilizer was applied at about the following rate per acre:

Nitrate of soda	125 lbs.
Dried blood	100 lbs.
Acid phosphate	650 lbs.
Muriate of potash	125 lbs.

This makes a total of about half a ton per acre.

Much experimental work has been done with fertilizers, but there must still be much guesswork in their use. No one can tell the farmer just what his land needs; the soil must give the answer. A neglected orchard like this needs nitrogen. Its lack of thrift and small amount of growth prove it. In well-managed orchards, with soil of ordinary fertility, nitrogen can be supplied by leguminous cover crops. It can be supplied in the same way in the neglected orchard, when once under way. In the beginning of the improvement, nitrate of soda or stable manure will help to get the growth desired.

The second step was to plow the orchard and till the ground. Tillage is manure; it will help nitrogen to bring about growth. If we wish to grow apples, we cannot afford to have the tree battling with weeds or with grass. The tree needs the moisture and the food; weeds and grass will rob it of them. Tillage should continue frequently during early summer. By midsummer wood growth should cease; tillage should then stop. A cover crop sown then will protect the soil from washing and add humus to it. If the crop belongs to the clover family, it will gather nitrogen for next year's growth.

All good rules have some exceptions. The best way may not be the best in all cases. Sometimes it may not be best to plow the orchard. It may be on a hillside which is too steep; it may be too full of rocks, or something else may prevent. Two alternatives are open which will yet permit good fruit. The orchard may be pastured with sheep or with hogs. Hogs will plow it; sheep will not. In either case more animals should be kept than the grass in the orchard will support. Grain should be fed to supplement the grass. That brings fertility to the orchard. It also insures that the grass shall not grow tall. Grass will evaporate less water if kept short. The other alternative is to let the grass grow, then mow it and let it lie about the trees. This system seems to contradict the idea of growth upon which the system of tillage is founded, but it has a few advocates who show excellent results. It insures a winter mulch and adds humus to the soil, but draws heavily upon the soil moisture during early summer. It is, therefore, not strange that its advocates thus far seem to be those who are dealing with a wet soil or a rainy climate.

These things alone will not produce good apples. There are enemies to fight. Pruning, tillage, and manure will only make the worms happy. Bugs and fungi are on the alert; war must be waged. The orchard in question was sprayed with Bordeaux mixture and Paris green twice after the blossoms had fallen. The Bordeaux mixture cleared the limbs of the hanging lichens or "moss." The Paris green numbered the days of some

of the worms. A marked improvement appeared; yet the results were not striking. It takes more than one year to bring up such an orchard. Spraying destroys many enemies, but not all. It cannot reach the apple maggot. In spite of the treatment, these pests ruined much of the fruit. They must be handled in other ways.

The treatment of this orchard was continued in 1900. The trees were sprayed with Bordeaux mixture before the buds opened. This is effective against apple scab, and cleans the bark of many low forms of fungous growth. The trees were sprayed again after the blossoms fell. The cover crop of 1899 consisted of oats and peas. These did not thrive. The oats dried up, and the peas made little growth. Nitrogen was, therefore, continued in the fertilizer, but this year the amount of fertilizer was dropped to five hundred pounds per acre, made up as follows:

Nitrate of soda	100 lbs.
Dried blood	100 lbs.
Tankage	100 lbs.
Acid phosphate	100 lbs.
Muriate of potash	100 lbs.

In choosing this combination the composition of a good crop of apples was used as a basis. Considerably more of each element was supplied than the apples would remove. This is fairly safe guessing. It supplies all the needs, but the soil may contain enough of some of the elements. Experiment alone could determine that. Tillage was continued as before. The trees suffered somewhat from the attacks of plant-lice. Aside from that they were in good condition. The growth was not large, but thrifty. The foliage was dark, large, and vigorous. That on adjoining trees not under care was much lighter in color and smaller. Fig. 5 shows a comparison between leaves from treated and untreated trees. The photograph shows difference in size, but not in color. Comparison with colored silks showed several shades difference between the two lots. The orchard bore some good fruit in 1900. The Baldwin and Russet trees were well loaded. The second spraying was delayed a little too long, and the codling moth did much injury. The apple maggot was also troublesome.

In 1901 the orchard was pruned, sprayed, and fertilized as directed. Spraying was done on time, and the results were much more effective.

The cover crop used in 1900 was crimson clover. The growth was small, and nitrogen was continued as before, the fertilizer applied being the same in kind and amounts as in 1900. Throughout the experiment, plowing and tillage have been left to the owner to do. This year, owing to an accident, that part of the work was dropped when only part of the orchard was plowed. No further tillage was given. The orchard, however, shows the effect of the previous years' treatment. The Greening and Russet trees bore a good crop of fruit, in spite of the general apple failure throughout the region. Some early varieties also bore well. Much of this fruit was very fine. Fig. 7 and the illustration upon the cover show the proportion of apples injured by the codling moth.

The apple maggot has been the most troublesome pest. This is known to many as the railroad worm. It is the larvae of a small fly, which

Fig. 6.

THE GREENING AND RUSSETT TREES BORE WELL.

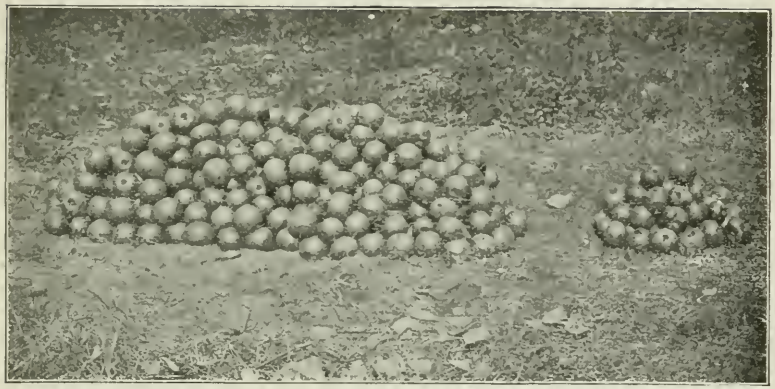


Fig. 7.
EFFECT OF SPRAYING—NO CODLING MOTH IN LEFT-HAND PILE.

Fig. 8.

"WILL IT PAY?"

punctures the skin of the apple and lays its egg underneath. The tiny worm is therefore beyond the reach of a spray as soon as hatched. No matter how thorough the spraying may be, therefore, the apples may be completely ruined by this insect. No direct method of attack offers itself. The most that can be done is to lessen injury for the following years. The larvae are said to mature but slowly until the apple begins to ripen; when it falls to the ground and grows soft they complete their growth, leave the apple and change to pupae just beneath the surface of the ground. In winter fruit, many are carried to the cellar, and pupate in the bins or barrels. If the windfalls can be destroyed as soon as they drop, and all refuse from the cellar can be burned, the numbers for the next season can be reduced. In this respect pasturing the orchard has an advantage. If well stocked with sheep or hogs, the apples are eaten before the insect is likely to escape. But even then, if adjoining orchards are neglected, little good may come.

Experiments have been in progress to determine whether spring plowing, if deep, may not bury the pupae so that they cannot emerge. The fly is a weak insect, and this method seems promising. Experiments thus far have been inconclusive. The soil of the orchard under treatment is comparatively light and sandy. In such a soil the insects might more readily emerge than in a heavier one. Other trees in the vicinity, under which the soil is undisturbed, would afford breeding grounds from which the orchard might be restocked each year. In another orchard a tree was covered with cheese cloth, and the soil underneath spaded to a depth of six or eight inches. This gave very promising results. The fruit was almost entirely free from injury. Further experiments are needed before the question can be settled. Such experiments are under way.

The orchard in question has not had the care it needed. It has frequently been neglected. In spite of this, it has proved that a neglected orchard can be easily brought into good bearing condition. It is a family orchard with many varieties and a large proportion of early apples. It was not, therefore, feasible to put the experiment on a strictly commercial basis. Yet in 1901, with only part of the trees in bearing, about $80 worth of fruit was harvested. Over $50 worth of Russets and Greenings were sold. The orchard covers about eighty-six hundredths of an acre. Few parts of the farm offer better chances of profitable return than the orchard, if well managed.

PROUD DAY FOR OREGON.

FRUIT AT BUFFALO RANKED ALL COMPETITORS — WHAT WINNING OF THE WILDER MEDAL MEANS — LIST OF THOSE WHO CONTRIBUTED THE FRUIT.

By Hon. Henry E. Dosch, Special Commissioner.

In order that the high value of this medal may be better understood, and the reason why all fruitgrowers' societies and states as well as individuals are competing for it, and the winners are the recipients of the congratulations by their less favored friends, I will explain.

The Pomological Society of America comprises all the noted horticulturists and fruit savants, both professional and practical, actual growers of the United States and Canada.

Sentiment or sectional favoritism has no place in the deliberations and nothing but absolutely fruit of merit is taken into consideration by the committee on awards, of which Dr. F. M. Hexamer, the veteran editor of the American Agriculturist, is and has been chairman for many years, a guarantee in itself that all favoritism is eliminated from their deliberations. Decisions are based strictly on merits, which, perhaps, is the principal reason so high a value is placed on the Wilder medal.

ORIGIN OF THE WILDER MEDAL.

The Pomological Society of America, which includes the British Provinces, was founded some seventy years ago. Marshal P. Wilder, the veteran enthusiast in horticulture, was its first president, and for many years filled that important position. It included among its members, then as now, all the noted fruitgrowers.

In order to stimulate the production of new varieties as well as perfect fruits, the society gave money prizes, which, however, for obvious reasons, did not prove satisfactory, and they decided on medals of award instead, and in honor of their president and promoter the name "Wilder medal" was given it. When Mr. Wilder died he left a fund of $1000, the interest of which was to be devoted to silver and bronze medals for new fruits; most perfect fruits; largest collection of fruits of any given pomological variety, etc., and to be awarded only by its own members for pure merit, which has been religously carried out ever since.

OREGON CONTRIBUTORS.

We entered our fruits in the name of the state of Oregon, rather than as individuals, as the most perfect fruit, so all could share in the honor and glory thus bestowed; but it is in order to give the names of those who were kind enough to contribute to our exhibit to make the winning of so high a prize possible.

We exhibited two hundred and fifty plates of fresh fruits of this year's growing, which was contributed by E. L. Smith, Hood River—Baldwin, Spitzenburg, Wealthy, Kay, White Winter, Pearmain, and Gravenstein apples; William Anderson, Milton—20-ounce Pippin apples; Asa Haladay, Scappoose—Gravenstein, Wealthy, Hislop, Siberian, and Transendant crab apples; B. G. Leedy, Tigardville—three-tier Gravenstein apples.

W. J. Baker, Hood River; L. T. Reynolds, Salem; J. C. Courtney, Portland—Bartlett pears.

L. T. Reynolds, Salem; Alex. Anderson, The Dalles—Fellenberg (Italian) prunes.

Mrs. A. J. Armstrong, Portland—Fellenberg prunes and egg plums.

Lewis Bros., Russellville—Fellenberg and Giant prunes.

Mrs. C. M. Shields, Freewater; Dr. J. R. Cardwell, Portland—Coe's Golden Drop plums.

Mrs. S. Sutton, Portland; Adam Fleck, The Dalles; John Strahn, Freewater; K. S. & D. Fruit Land Co., Arcadia; H. C. Sholes, Portland; Emile Schanno, The Dalles; W. H. Taylor, The Dalles, and Henry E. Dosch, Hillsdale—Pond (Hungarian) prunes.

Lewis Bros., Russellville; T. V. Sluman, Mount Tabor—Pacific prunes.

There are no doubt others who will send us fruits in due season, equally meritorious, as well as those who have sent fruits earlier in the season, and all can feel a pride and have a full share in the winning of the highest award for excellent and perfect specimens of their several fruits.

The immense size and high color of our apples, pears, plums and prunes was a revelation not only to the committee of awards and other members of the American Pomological Society, but also to the thousands of visitors, who are so profuse in words of admiration.

The contributors of strawberries, cherries, peach plums, peaches, and other earlier fruits are: G. J. Gessling, Hood River; Mrs. Capt. Angerstein, Portland; Mark Levy & Co., Portland; Cyrus H. Walker, Albany; W. J. Magoon, Portland; H. W. Prettyman, Mount Tabor; A. T. Webb, Portland; B. S. Huntington, The Dalles; Richard Scott, Milwaukie; L. M. Gilbert, Salem; S. S. Shields, Freewater; M. E. Hendricks, McMinnville; J. N. Scriber, La Grande; H. A. Lewis, Russellville; Mrs. C. M. Shields, Freewater; C. M. & G. G. Stackland, Cove; H. J. Geer, Cove; J. E. Courtney, Portland, and E. M. McIntire, Ashland.

WHAT IT MEANS.

The Oregon delegation here as well as the visitors from our glorious state are naturally highly elated and proud of the honor conferred, and their rejoicing is pardonable when we consider that nearly all other state exhibits are so very much larger than ours, many having one thousand plates to our two hundred and fifty plates, but blood will tell, and it was "quality" and not "quantity" that won the Wilder medal. The winning of this medal means much for Oregon; it is worth more to our state than all the medals and diplomas awarded to us at the expositions, past, present and to come, as it is an honor no exposition, however large, can

confer. The praise of the Oregon fruit exhibit will be sung and published, not alone in America and Canada, but in England, France and Germany, and will do a missionary work at one stroke that years of advertising could not accomplish.

It is to be hoped that the winning of this medal will act as a stimulant to our fruitgrowers to produce only the very best of fruit, and contribute freely, not only to any further exhibit that may be made at other exhibitions, but continue their liberal support for the present.

PAN-AMERICAN EXPOSITION.

LIST OF MEDALS AND DIPLOMAS AWARDED TO OREGON EXHIBITORS ON HORTICULTURE, POMOLOGY, AND VITICULTURE.

Name.	*Address.*	*Article.*
GOLD MEDALS.		
State of Oregon		Collection of pomaceous and drupaceous fruits, berries, and nuts, fresh, evaporated, and preserved.
State of Oregon		Collection of apples, season 1900, not kept in cold storage.
State of Oregon		Collective exhibits of fresh fruits, season 1901, throughout the entire exposition.
State of Oregon		Collective exhibit of evaporated fruits.
State of Oregon		Exhibition of drupaceous fruits preserved in liquid for exhibition purposes.
E. L. Smith	Hood River	Collection of apples.
Mrs. C. M. Shields	Freewater	Collection of plums, pears, prunes, etc.
Max Pracht & Sons	Ashland	McDeavitt peaches.
A. Holaday	Scappoose	Apples, pears, and plums.
J. E. Courtney	Portland	Apples, pears, and plums.
William Ehrk	Hood River	Apples.
William H. Taylor	The Dalles	Prunes.
George Booth	Hood River	Apples.
W. P. Watson	Hood River	Silver prunes in liquid.
Henry E. Dosch	Portland	Pears, prunes, plums, and cherries in liquid.
F. A. Rueter	Forest Grove	Black Hamburg grapes in liquid.
Mrs. B. M. Shannon	Albany	French walnuts.
State Board of Horticulture		Biennial reports 1898–1900, edited and compiled by Henry E. Dosch.
SILVER MEDALS.		
Mrs. J. A. Armstrong	Portland	Prunes and plums.
Mrs. S. Sutton	Portland	Prunes.
R. Cooper	The Dalles	Cherries.
C. L. Rogers	Hood River	Apples.
Henry E. Dosch	Portland	Pond prunes.
Lewis Brothers	Russellville	Prunes and plums.
Dr. J. R. Cardwell	Portland	Prunes and plums.
K. S. & D. Fruit Land Co.	Arcadia	Prunes.
W. W. Nason	Hood River	Apples.
G. J. Gessling	Hood River	Cherries.
B. G. Leedy	Tigardville	Gravenstein apples.
E. L. Smith	Hood River	Apples in liquid.
W. K. Newell	Dilley	Apples in liquid.
L. T. Reynolds	Salem	Prunes and raspberries in liquid.
Judd Geer	Cove	Prunes and plums in liquid.
Levina Foster	Salem	160 jars of fruit for table use.
Henry E. Dosch	Portland	French walnuts and almonds.
C. E. Stewart	Medford	Almonds.
BRONZE MEDALS.		
Mrs. C. M. Shields	Freewater	Wolf River apples.
Mrs. Captain Angerstein	Portland	Cherries.

Oregon
Fruit Exhibit
Gold Medal
Display of Fruit

AMERICAN POMOLOGICAL SOCIETY - FOUNDED 1848
Pan American Exposition
Buffalo
1901
MARSHALL PINCKNEY WILDER, PRES.

LIST OF MEDALS AND DIPLOMAS AWARDED—CONCLUDED.

Name.	*Address.*	*Article.*
C. M. & G. G. Stackland	Cove	Cherries.
W. J. Baker	Hood River	Bartlett pears.
W. J. Magoon	Portland	Strawberries.
R. Scott	Milwaukee	Bing cherries.
L. N. Guy	Portland	Salway peaches.
Mark Levy	Portland	Bing cherries.
H. J. Geer & Son	Cove	Bing cherries.
J. N. Scriber	La Grande	Bing cherries.
J. Burgoyne	New Era	King apples.
Cyrus H. Walker	Albany	Napoleon cherries.
Fred Knudson	Hood River	Apples.
D. R. Cooper	Mt. Hood	Apples.
G. A. McCurdy	Hood River	Strawberries.
J. W. Davis	Portland	Quinces.
B. R. Tucker	Hood River	Apples.
F. G. Church	Hood River	Strawberries.
C. S. Sholes	Portland	Prunes.
T. V. Sluman	Mt. Tabor	Prunes.
A. J. Anderson	The Dalles	Prunes.
H. C. Bateman	Hood River	Plums.
Emile Schanno	The Dalles	Prunes.
J. R. Douglas	Albany	Apples.
E. E. Covey	Portland	Quinces and apples.
W. B. Glafke	Portland	Salway peaches.
John Strahm	Freewater	Prunes.
H. W. Prettyman	Mt. Tabor	Cherries.
A. T. Webb	Portland	Cherries.
B. S. Huntington	The Dalles	Apricots.
S. S. Shields	Freewater	Peach plums.
J. B. Deardorf	Lents	Cherries.
W. E. Willis	Willsburg	Prunes.
B. R. Cardwell	Portland	Quinces.
Henry Schroten	Roseburg	Pears.
E. M. McIntire	Ashland	Crawford peaches.
G. Voorhies	Medford	Beurre Clairgeau pears.
W. W. Nason	Mt. Hood	Hyde's King of the West apple.
L. T. Reynolds	Salem	Prunes.
W. C. King	Sand Lake	Cranberries in liquid.
Lewis Brothers	Russellville	Prunes and pears in liquid.
W. S. Failing	Portland	Orange quinces in liquid.
H. Freeborough	Mt. Tabor	Pacific prunes in liquid.
O. P. S. Plummer	Portland	Egg plums in liquid.
L. Manning	Hillsboro	Golden prunes in liquid.
Wm. Borsch	Hillsdale	French walnuts and filberts.
J. H. Settlemier	Woodburn	Italian chestnuts.
A. H. Carson	Grants Pass	Almonds.
Henry Hewett	Portland	English filberts.
F. A. Rueter	Forest Grove	Muscat and Burgundy wines.
L. T. Reynolds	Salem	Bing cherries.
HONORABLE MENTION.		
H. A. Lewis	Russellville	Apricots.
Charles Gattey	Empire City	Cranberries.
William Anderson	Milton	Apples and pears.
E. S. Edwards	Portland	Apples.
Fred Freudig	Freewater	Apples and plums.
W. S. Miller	Claskanine	Ben Davis apples.
W. J. Magoon	Portland	Plums, cherries, and berries.
George H. Lamberson	Portland	King apples.
William Knudson	Mt. Hood	Baldwin apples.
M. E. Hendricks	McMinnville	Charlotte peaches.
Adam Fleck	The Dalles	Prunes.
J. H. Brotje	Milwaukie	Grapes.
H. Heitkemper	Milwaukie	Grapes.
Ashland Fruit Association	Ashland	Peaches.
Alexander La Follette	Wheatland	Green Gages in liquid.
C. E. Hoskins	Springbrook	Willamette prunes in liquid.
W. K. Newell	Dilley	Egg plums in liquid.
E. V. Carter	Ashland	Salway peaches in liquid.
W. E. Wills	Willsburg	Apple quinces in liquid.
F. C. Strugle	The Dalles	Pound pears in liquid.
Theodore Miguett	The Dalles	Holland pippin apples in liquid.
Emile Schanno	The Dalles	Various apples in liquid.

SOUTH CAROLINA INTERSTATE AND WEST INDIAN EXPOSITION.

LIST OF MEDALS AND DIPLOMAS AWARDED TO OREGON EXHIBITORS IN HORTICULTURE AND POMOLOGY.

Name.	*Address.*	*Article.*
GOLD MEDALS.		
S. L. Bennett	Medford	Apples not kept in cold storage.
William Borsch	Hillsdale	French walnuts and filberts.
A. H. Carson	Grants Pass	Grapes.
Henry E. Dosch	Portland	French walnuts, chestnuts, almonds, and butternuts.
Henry E. Dosch	Portland	Fruits in liquid.
Henry E. Dosch	Portland	Methods for preserving fruits for exhibition purposes.
William Ehrck	Hood River	Yellow Newtown pippin apples.
W. S. Failing	Portland	Orange quinces.
P. Fleck	Grant	Flaming Tokay grapes.
H. Freeborough	Mt. Tabor	Pacific prunes.
Judd Geer	Cove	Prunes and plums.
Asa Holaday	Scappoose	Apples not kept in cold storage.
C. E. Hoskins	Springbrook	Willamette prunes.
Alex. La Follette	Wheatland	Green Gage plums.
Math Levy	Portland	Lady apples.
Lewis Bros.	Russellville	Prunes and pears.
L. Manning	Hillsboro	Golden prunes.
Theodore Mignett	The Dalles	Holland pippin apples.
W. K. Newell	Dilley	Gravenstein apples.
Oregon State Board of Horticulture	Portland	Biennial reports, 1898–1900; edited and compiled by Henry E. Dosch.
O. P. S. Plummer	Portland	Egg plums.
Max Pracht & Sons	Ashland	Peaches.
L. T. Reynolds	Salem	Prunes and raspberries.
F. A. Rueter	Forest Grove	Black Hamburg grapes.
Emile Schanno	The Dalles	Apples and pears.
J. H. Settlemier	Woodburn	Chestnuts and walnuts.
Mrs. B. M. Shannon	Albany	French walnuts.
E. L. Smith	Hood River	Apples not kept in cold storage.
State of Oregon		Apples—season of 1900–1901.
State of Oregon		Collective exhibit of pomaceous and drupaceous fruits.
State of Oregon		Collective exhibit of evaporated fruits.
B. R. Tucker	Hood River	Apples.
W. P. Watson	Hood River	Branch of Silver prunes.
Warren Wells	Hood River	Apples.
SILVER MEDALS.		
G. Anderson	Hillsboro	Bartlett pears.
Mrs. L. Anderson	Portland	Black figs.
Mrs. Bell	Portland	White figs.
A. H. Carson	Grants Pass	Almonds.
E. V. Carter	Ashland	Peaches preserved in 1892.
J. E. Courtney	Portland	Apples.
Henry Hewett	Portland	Filburts.
Alex. La Follette	Wheatland	Butternuts.
George H. Lamberson	Portland	Gloria Mundi apples.
Mark Levy	Portland	Spokane Beaury apples.
W. K. Newell	Dilley	Egg plums.
C. E. Stewart	Medford	Almonds.
F. C. Strugle	The Dalles	Pound pears.
W. E. Wills	Willsburg	Apple quinces.
BRONZE MEDALS.		
W. G. King	Sand Lake	Cranberries.

DAYS GONE BY.

O the days gone by! O the days gone by!
The apple in the orchard and the pathway through the rye;
The chirrup of the robin and the whistle of the quail,
As he piped across the meadows sweet as any nightingale;
When the bloom was on the clover and the blue was in the sky,
And my happy heart brimmed over in the days gone by.

In the days gone by, when my naked feet were tripped
By the honeysuckle's tangles, where the water lilies dipped,
And the ripple of the river lipped the moss along the brink,
Where the placid-eyed and lazy-footed cattle came to drink,
And the tilting snipe stood fearless on the truant's wayward cry,
And the splashing of the swimmer in the days gone by.

O the days gone by! O the days gone by!
The music of the laughing lip, the luster of the eye;
The childish faith in fairies and Aladdin's magic ring,
The simple, soul-reposing, glad belief in everything,
When life was like a story, holding neither sob nor sigh,
In the olden, golden glory of the days gone by.

—James Whitcomb Riley.

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